Chapter 4.1 NONPOINT SOURCE ASSESSMENT, PRIORITIZATION, AND ACTIVITIES

This section of the Virginia Water Quality Assessment 305(b) Report includes an assessment at the smallest statewide hydrologic unit level[1] (hereafter referred to as either hydrologic units or just units) of nonpoint source (NPS) pollution potential. It also includes indicators for prioritizing corrective actions to unacceptable levels of NPS pollutants at the hydrologic unit level and a summary of NPS reduction activities currently underway. It has been prepared by the Virginia Department of Conservation and Recreation (DCR) to provide a comparative evaluation of the state's waters, on a hydrologic unit basis (see Table 4.1-2) for assisting in the targeting of limited resources and funds for NPS pollution protection activities to where they are needed the most.

The 2004 NPS Assessment and Prioritization study summarizes information from the Virginia Department of Conservation and Recreation, Virginia Department of Environmental Quality (DEQ), Virginia Department of Forestry (DOF), U.S. Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS), local Soil and Water Conservation Districts (SWCDs), the Department of Biological Systems Engineering (BSE) of the Virginia Polytechnic Institute and State University (VPI&SU), the Chesapeake Bay Local Assistance Department (CBLAD), the Virginia Department of Health (VDH), the Virginia Department of Game and Inland Fisheries (VDGIF), the Center for Environmental Studies (CES) at Virginia Commonwealth University (VCU), the US Environmental Protection Agency (EPA), the Chesapeake Bay Program (CBP), and other existing sources of information concerning nonpoint source impacts to Virginia waters.

There are three major components to the 2004 NPS Assessment and Prioritization study - potential pollutant loadings, water quality impairments, and biological health. The main focus is the determination of potential loadings of nitrogen, phosphorous, and sediment (hereafter referred to as NPS pollutants) by hydrologic unit by general land use categories. The evaluation of hydrologic units by impaired waters represents an actual water quality measure not necessarily related to the NPS pollutant loads. In order to prioritize clean up and protection activities, there are also determinations of which hydrologic units are of prime importance for the protection of public surface water supplies and for the protection of critical aquatic species. Details on these components follows.

NPS POLLUTION LOADINGS

The NPS Assessment of pollutant loadings was performed for the 2002 305(b) Report and has not changed from what was reported in that report. It is a calculation of the estimated edge of stream (EOS) loadings of nitrogen, phosphorous, and sediment per hydrologic unit using a model whose input data sets had spatial resolutions that were much smaller than these units.

The calculation of loads of NPS pollutants as a basis for assessing water quality by hydrologic unit is also consistent with Virginia=s participation as a partner with the EPA=s CBP in the calculations of NPS pollutant loads using the Chesapeake Bay Watershed Model (CBWM). Results from the CBWM, however, have only been obtainable for that portion of Virginia that is in the Chesapeake Bay Watershed (James, York, Rappahannock, Potomac, and Bay Coastal basins). There have been instances in the past where CBWM results and the previous state NPS assessment results have conflicted in the Chesapeake Bay portion of the state. There is also a desire by the DCR staff to have measures similar to the CBWM loads available for the non-Bay portion of the state, so that this resource could be used for programs with statewide extent.

In order to obtain statewide NPS pollution values, DCR has contracted with the CBP and the US Geological Survey (USGS) to add all of Virginia into the CBWM for Phase 5 of that model. This process

[1] These units are technically referred to as Virginia=s sixth order (14 digit) hydrologic units. The Hydrologic Unit Geography page at www.dcr.state.va.us/sw/hu.htm contains information about these units.

has begun but will not produce NPS pollutant loads for a few more years. For the interim period, DCR contracted with the VPI&SU BSE Department to produce NPS pollutant load results similar to those of the CBWM but using a more simplified model.

The BSE evaluated a number of models for this application before choosing the Generalized Watershed Loading Functions (GWLF) model[2]. Assistance with GWLF model use, with CBWM use, and with data requirements for GWLF were provided by the Environmental Resources Research Institute at Penn State University, the CBP, and DCR respectively.

Before the GWLF model was used to develop NPS pollutant loadings for all hydrologic units in Virginia, it was calibrated to replicate CBWM results in the Chesapeake Bay drainage area. In calibrating the model for the Bay portion of Virginia, BSE aggregated CBWM model segments into larger calibration regions (10). Region development was modified during the calibration process, until the regions and their regional adjustment factors in the GWLF model sufficiently produced model output similar to that produced by the CBWM[3] for the Chesapeake Bay drainage area of Virginia. Non-Bay portions of the state were then related to one of these calibration regions and assigned the relevant factors.

The assessment runs of GWLF followed the completion of the calibration process. Whereas the CBWM uses and produces data in CBWM specific model segments (36 in Virginia), the assessment runs of GWLF used and produced data at the watershed level (493 in Virginia; the Chesapeake Bay itself was not modeled). Aside from not including factor adjustments, the assessment runs of GWLF differed from the calibration runs in that they used a new 2000 land use / land cover data set developed by DCR from a number of sources[4], and took into consideration the best management practice (BMP) installations and nutrient management planning occurring in Virginia over the five year period of 1995-2000 (when relevant) by DCR, the NRCS, CBLAD, and private plan writers. Table 4.1-1 lists the land use classification system used in the assessment runs of the GWLF model and the equivalent generalized model output land use categories. Spatially attributed BMP and nutrient management plan effects are measured as both land use changes to the aforementioned 2000 land use / land cover data set and as fractional reductions to the loadings by land use. Output from the assessment runs of GWLF are in the form of loading rates (R) per hectare (h) of NPS pollutants (p: nitrogen, phosphorous, and sediment) per land use (l: agriculture, urban, and forest) for each hydrologic unit (w). Loads (L) of each NPS pollutant per land use were calculated as:

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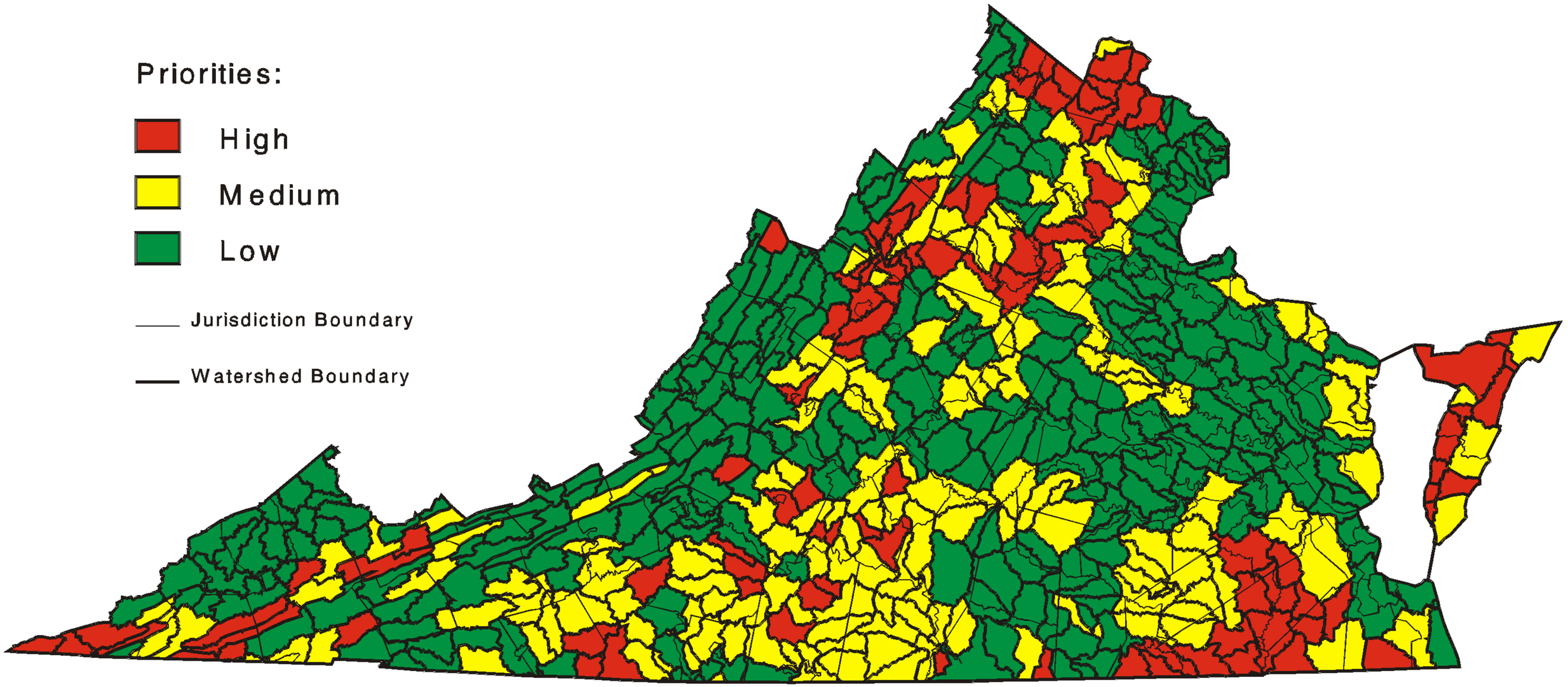
[2] GWLF was chosen because it was configured for continuous simulation and could produce EOS loads based on land-based loadings, fate, and transport of pollutants as does the CBWM. Both models also simulate seasonal variations, include both surface and subsurface components, and can represent both dissolved and particulate forms of pollutants.

[3] Calibration of the model to match output from version 4.3 of the CBWM required almost 200 runs of GWLF and included revisions to the model.

[4] The base for the 2000 land use / land cover data set is the National Land Cover Dataset (NLCD) from the US EPA. Agricultural uses were modified using the USDA 1997 Census of Agriculture and the National Crop Residue Management Survey from the Conservation Technology Information Center (CTIC). Additional classes were derived from processes developed for DCR by The Academy of Natural Sciences of Philadelphia (1997) using data from DCR=s confined animal databases and from the Virginia DOF.

Figure 4.1-1

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Agricultural Nitrogen Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings.

DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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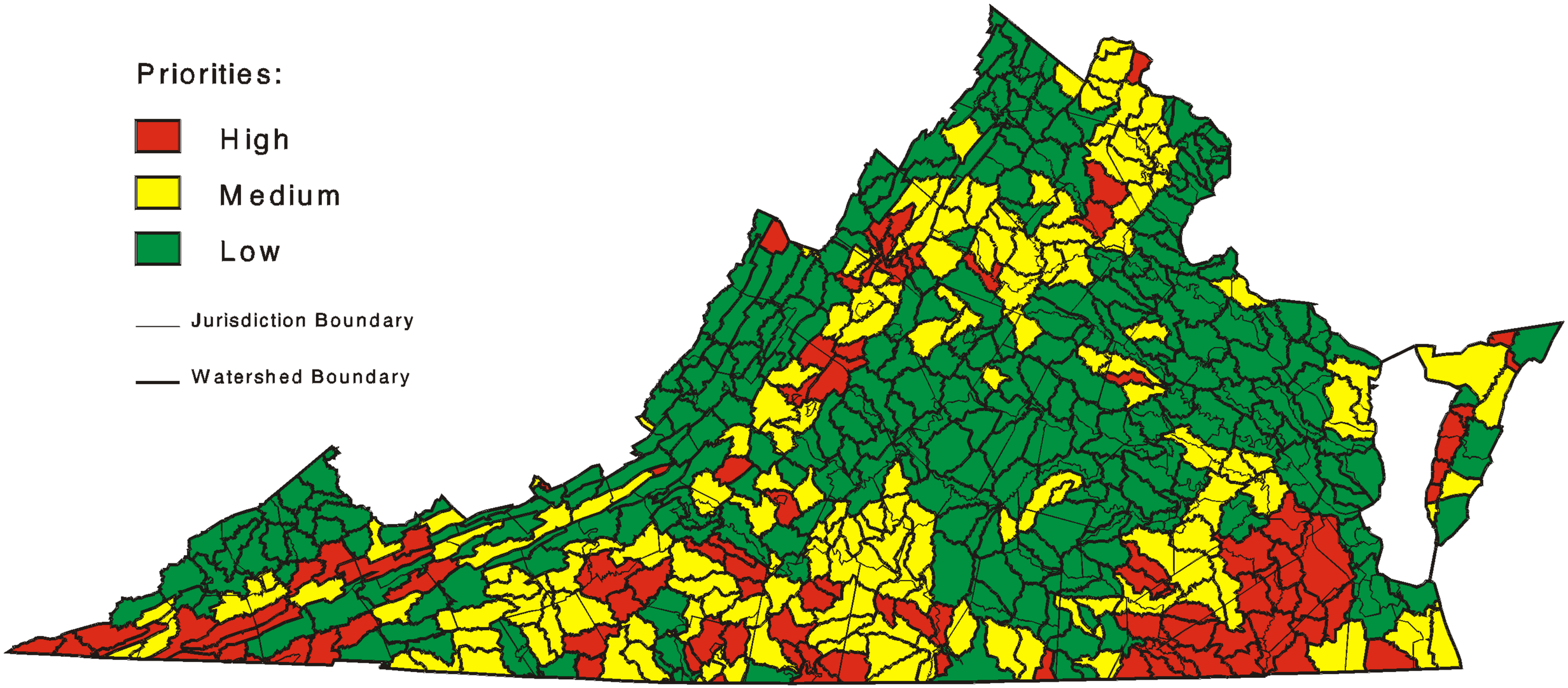
Figure 4.1-2

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Agricultural Phosphorus Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings.

DATA SOURCES:
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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

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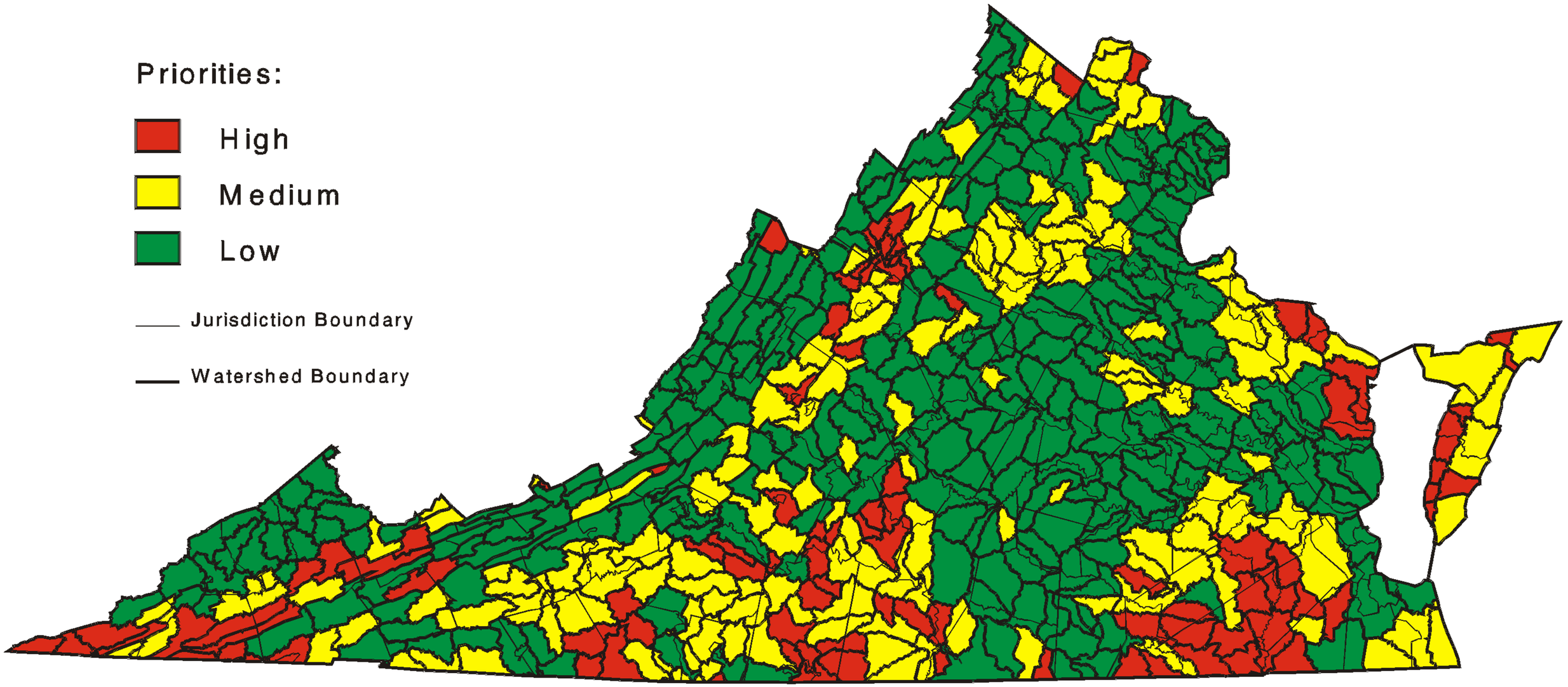
Figure 4.1-3

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Agricultural Sediment Unit Area Load Ranking



NOTE:
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DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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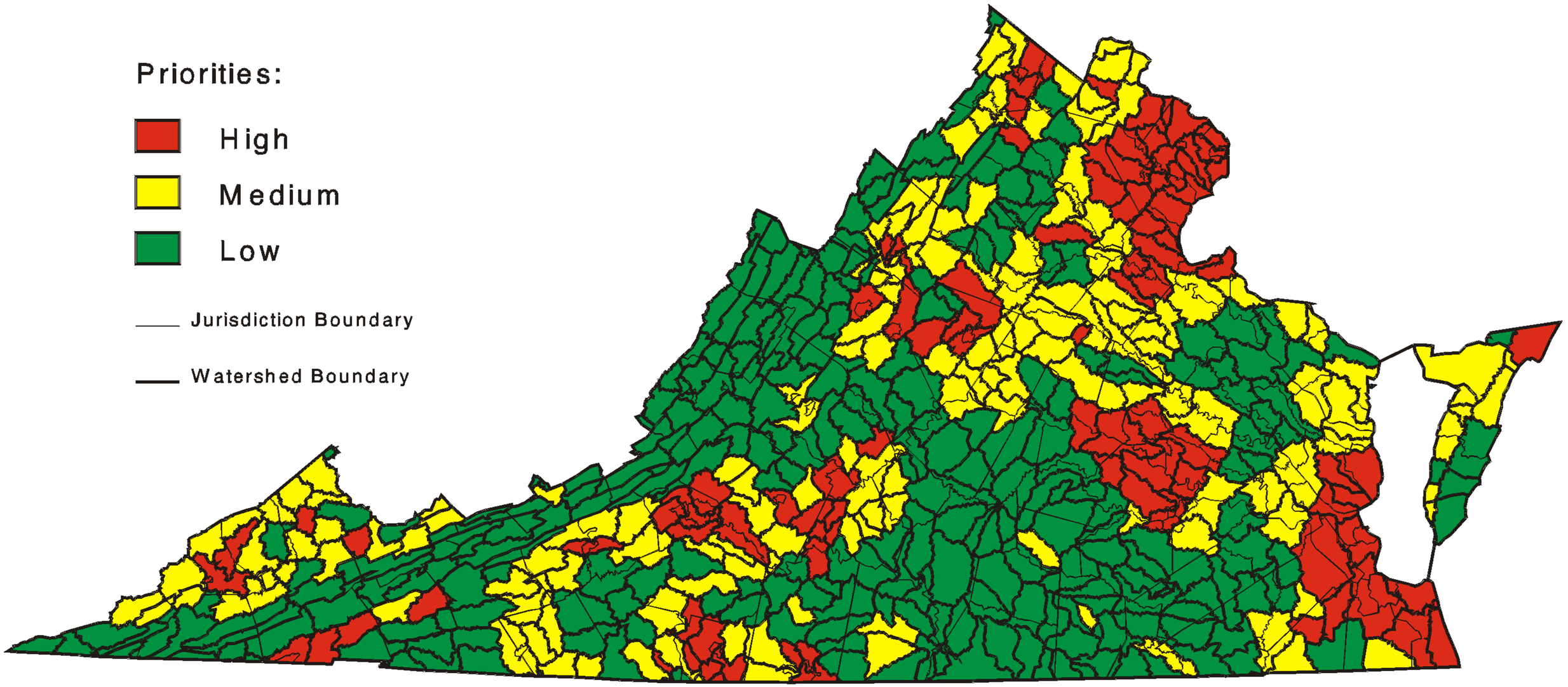
Figure 4.1-4

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Urban Nitrogen Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings. Most barren land is added to urban land in this study and is therefore also being portrayed on this map.

DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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$$R(plw) * h(lw) = L(plw)$$

For the purposes of ranking hydrologic units by NPS pollutant loads per land use, the loads per land use per pollutant were distributed to each hectare of a unit to produce a unit area load (UAL) per land use per pollutant for each watershed as follows:

$$L(plw) / h(w) = UAL(plw)$$

Multiple assessment runs were made and evaluated, with model refinements made between runs. Evaluations consisted of comparisons between calculated total basin loads from GWLF and those reported in various Tributary Strategy documents for Virginia, and by visual inspections of mapped unit area load rankings per pollutant per land use.

The output loadings provided a statewide equivalent of the types of results that Virginia has been able to obtain from the CBWM for the Chesapeake Bay drainage area of the Commonwealth over the last fifteen years.

In order to maintain a consistency with other circulating NPS assessment reports and maps, and with the manner in which this data is used, the ranking of hydrologic units for the NPS pollutant unit area loadings components for the 2004 NPS Assessment study has maintained the same division of derived values into categories that has been used before; the top 20% of the values for each component being classified as high, the next 30% being classified as medium, and the remaining 50% classified as low. This ranking methodology applies to the NPS pollutant loads only. These range definitions are not absolute, since units with equal loading values would not be divided into different classes.

Information regarding the NPS pollutant loadings by general land use and as summations per pollutant is found within the following sections.

Agricultural NPS Pollution Loads

Agriculture is a large and diverse industry in Virginia and accounts for approximately 24 percent of Virginia's land use. While this percentage is significantly lower than the national average and is declining in Virginia, agricultural activities continue to be the most significant source of nonpoint source pollution in the state. The current assessment model results suggest that about 70% of the total NPS nitrogen load in Virginia is from agricultural land. Likewise, over 60% of the total NPS phosphorous and sediment loads are reported to come from agricultural land.

Nonpoint source contamination from agriculture originates from several different sources with different associated impacts. Deposition of potential NPS pollutants to agricultural lands in the form of fertilizers and animal manures affect water quality when they reach groundwater reserves or are washed into streams, lakes, etc during rain storms in either a dissolved state or with eroding soils. Factors in this assessment which affect the amount of loads reaching water from agricultural lands include the erodability of the soils, types of agricultural practices, types and numbers of farm animals, land cover, stream density, rainfall, seasonal variations in plant growth and nutrient applications, existence and type of agricultural BMPs, soil saturation, and slope.

The ranked unit area loadings by hydrologic unit of nitrogen, phosphorus, and sediment from agricultural land uses are displayed in Figures 4.1-1, 4.1-2, and 4.1-3 respectively. The rankings are also listed in Table 4.1-3.

Urban NPS Pollution Loads

Although only 7 percent of the land in Virginia is considered urban, urbanization of forest and agricultural land is occurring at a rapid rate in many parts of the Commonwealth. This urbanized growth results in NPS pollution as the result of precipitation washing nutrients, sediment, and other toxic substances from the impervious surfaces that make up these areas. The sources of these surface contaminants include: air and rain deposition of atmospheric pollution; littered and dirty streets; traffic by-

products such as petroleum residues, exhaust products, heavy metals and tar residuals from the roads; chemicals applied for fertilization, control of ice, rodents and other pests; and sediment from construction sites. Illegal industrial, commercial and domestic hook-ups to storm sewers also contribute a number of specific pollutants to waterways, as do inadequate sewage disposal systems both for municipalities and individual homes.

Table 4.1-1 Land Use Classification

Original Class	Derived Class	Modeled Class	General Output Class
Evergreen Forest Deciduous Forest Mixed Forest Woody Wetlands Emergent Herbaceous Wetland		Forest	Forest
Bare: Transitional		Disturbed Forest	
Row Crop	Conventional Tillage Conservation Tillage	Conventional Tillage Conservation Tillage	Agriculture
Hay/Pasture	 Pasture Cattle-Grazed Pasture Poultry Litter Manure Acres	Hay Pasture Pasture Cattle-Grazed Pasture Poultry Litter Manure Acres	
Commercial/Industrial High Intensity Residential Low Intensity Residential Urban/Recreational Grasses Bare: Quarries and Pits Bare: Rock and Sand	 Wooded Residential	Impervious Urban & Pervious Urban	Urban

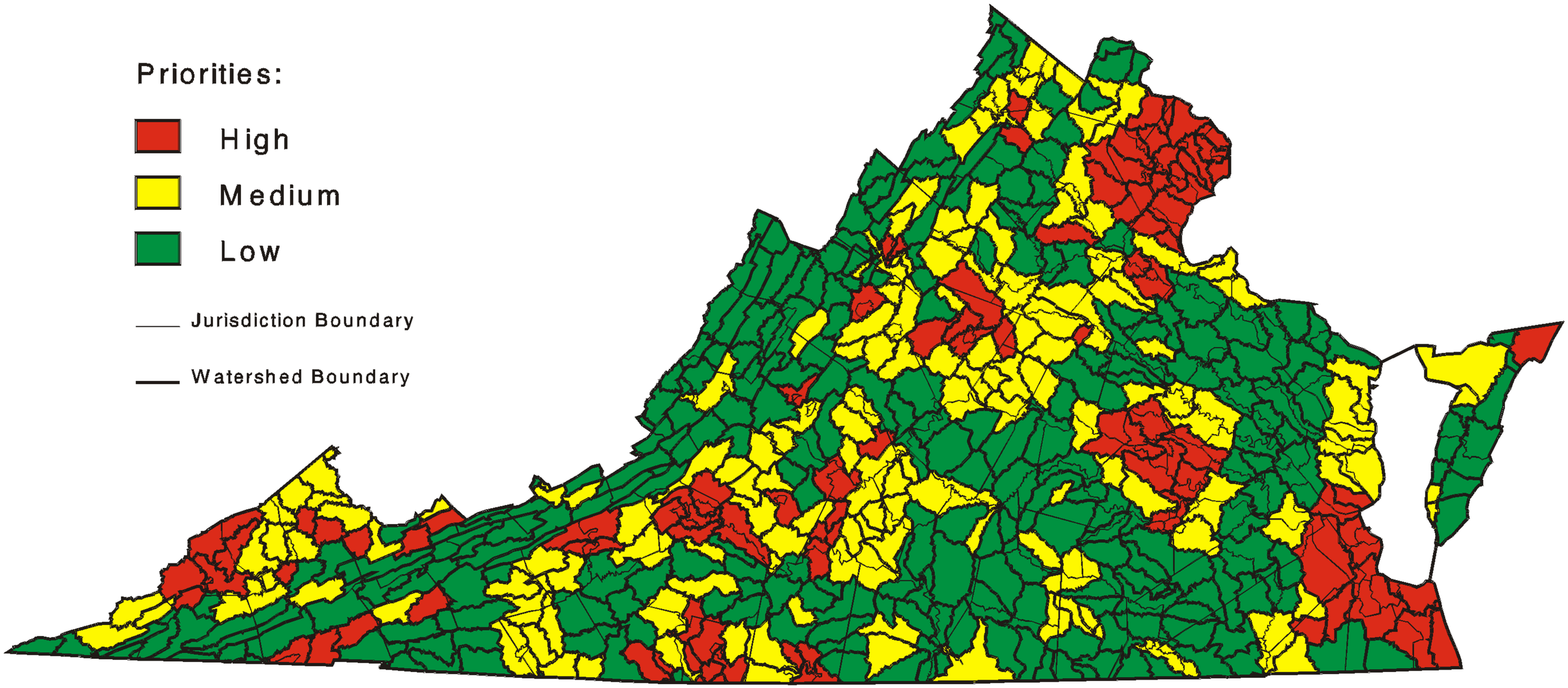
This assessment measured the nutrient and sediment loads from urban areas as opposed to all urban NPS pollutants as described. Factors in this assessment that affect the amount of loads reaching water from urban lands include the degree of imperviousness of the urban land use, impervious area NPS pollutant build-up rates, stream density, rainfall, septic system use, direct discharges, soil saturation, and slope.

The ranked unit area loadings by hydrologic unit of nitrogen, phosphorus, and sediment from urban land uses (as described in Table 4.1-1) are displayed in Figures 4.1-4, 4.1-5, and 4.1-6 respectively. The rankings are also listed in Table 4.1-3. The highlighted units are reflective of the areas of Virginia which are undergoing the most significant urban development activity. Urban load measures are based on pollution potential and do not compensate for urban runoff control measures that may be in place in some areas. Such reduction measures are primarily installed by the private sector.

Forestry NPS Pollution Loads

Figure 4.1-5

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Urban Phosphorus Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings. Most barren land is added to urban land in this study and is therefore also being portrayed on this map.

DATA SOURCES:
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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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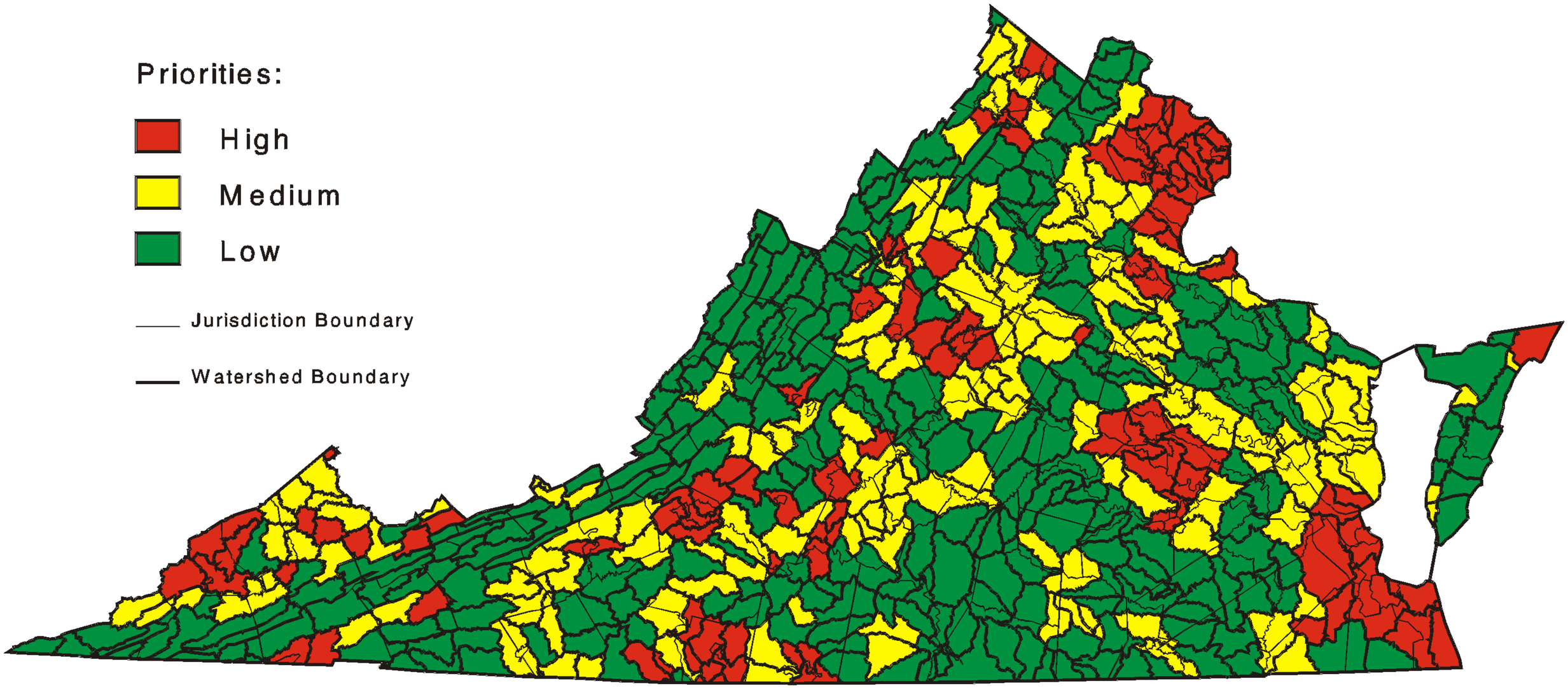
Figure 4.1-6

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Urban Sediment Unit Area Load Ranking



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DATA SOURCES:
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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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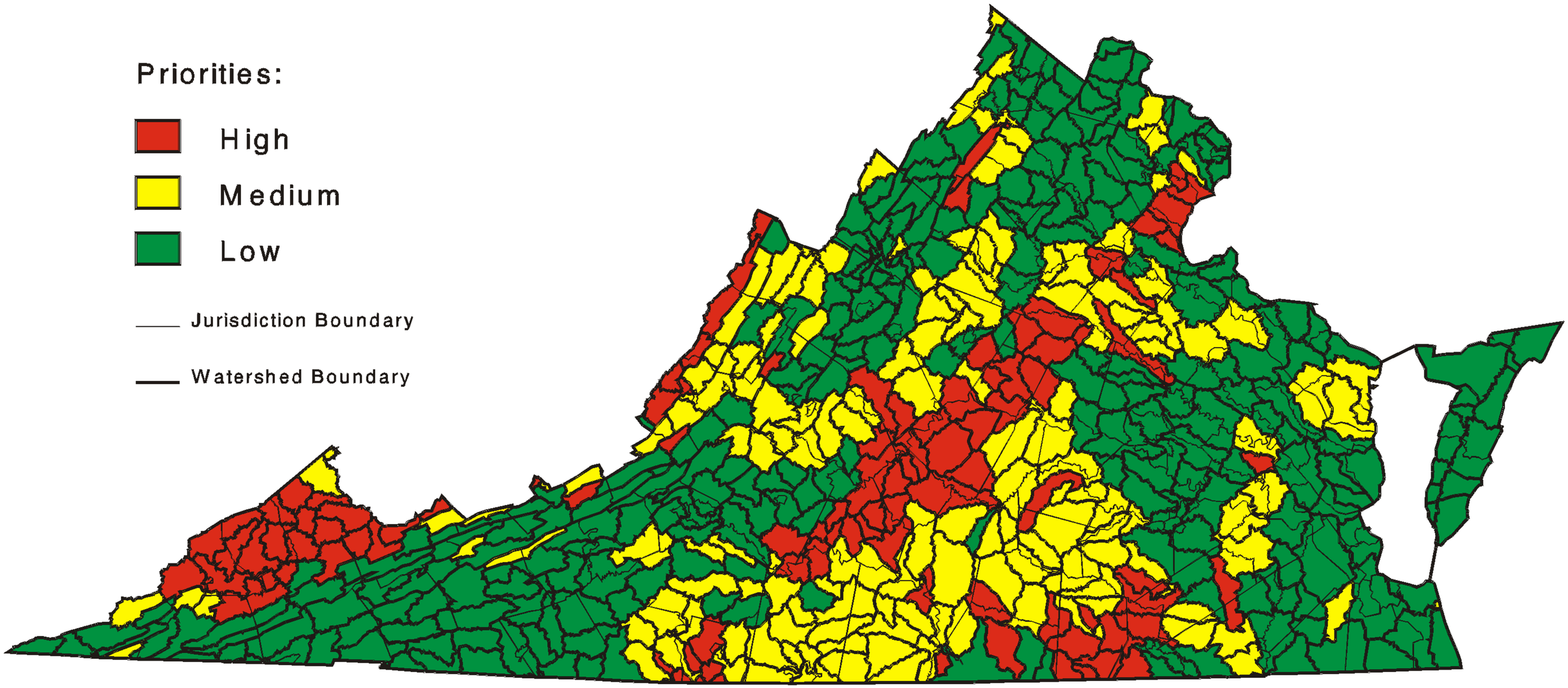
Figure 4.1-7

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Forest Nitrogen Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings. Forest loads include loads from forest land that is disturbed due to mining activities, an affect that is spatially concentrated in the Big Sandy Basin.

DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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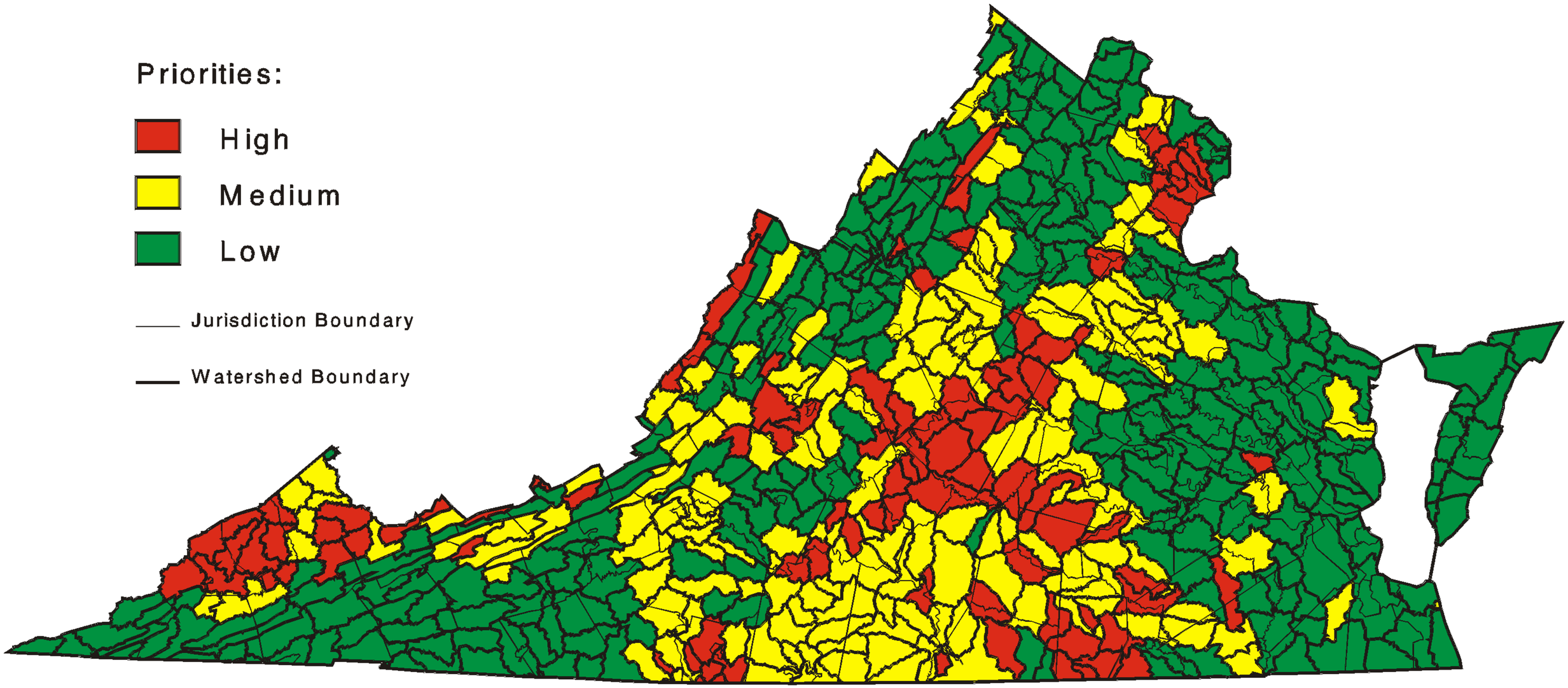
Figure 4.1-8

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Forest Phosphorus Unit Area Load Ranking



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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

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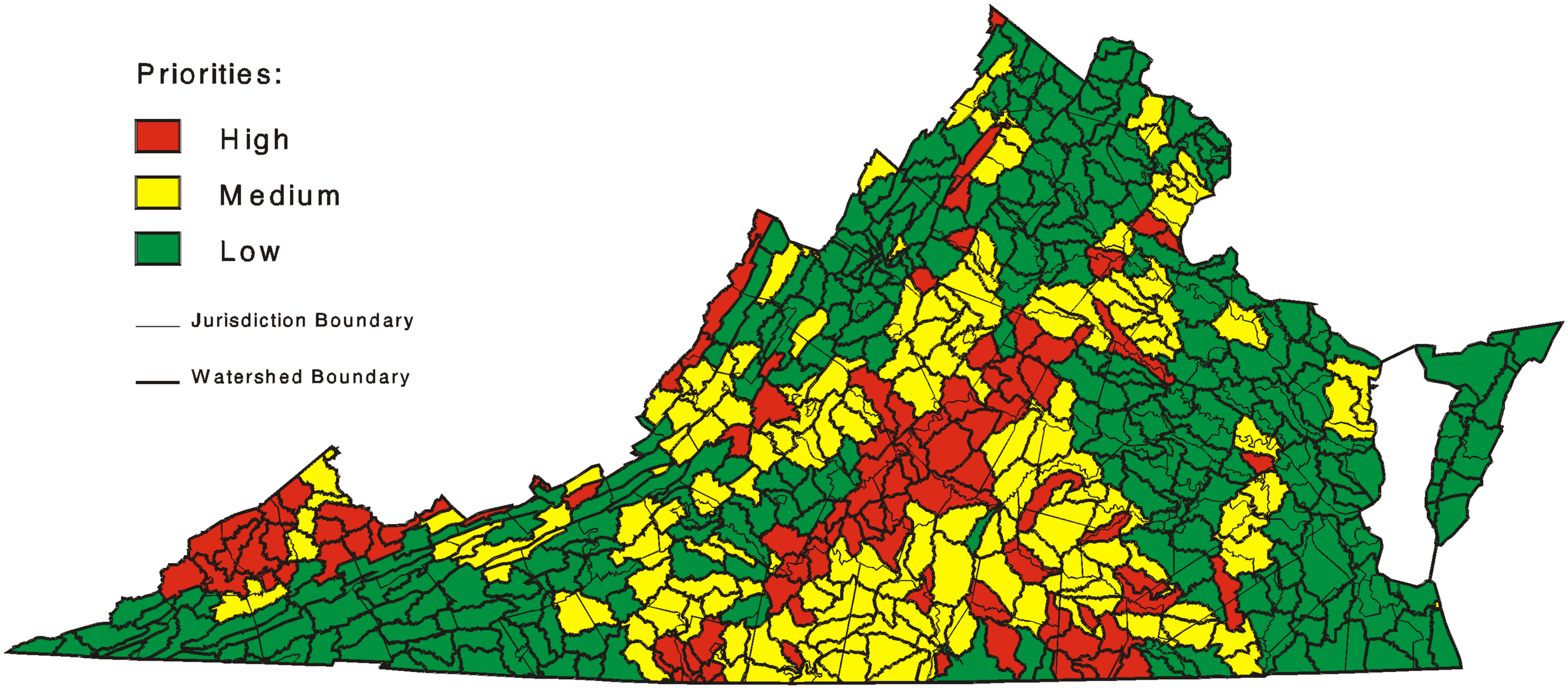
Figure 4.1-9

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Forest Sediment Unit Area Load Ranking



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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

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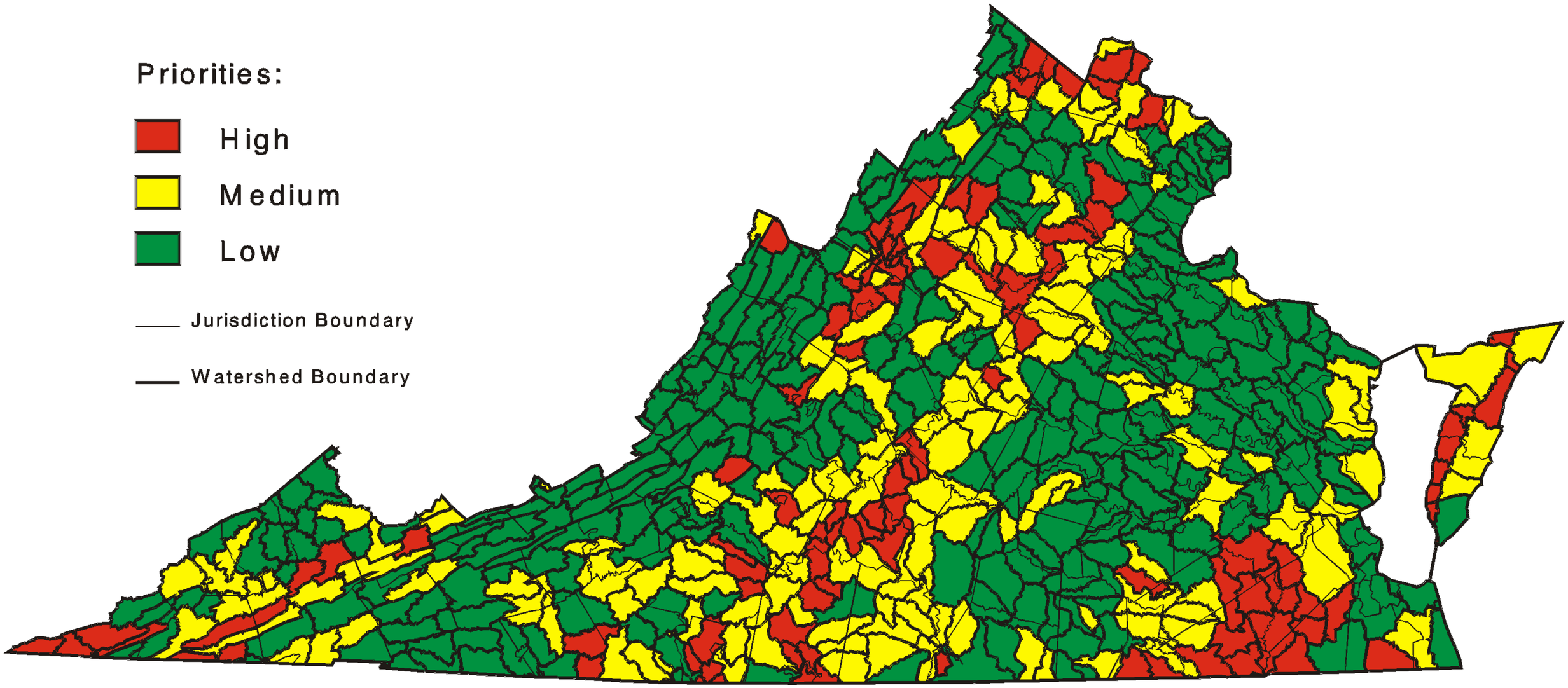
Figure 4.1-10

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Total Nitrogen Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings.

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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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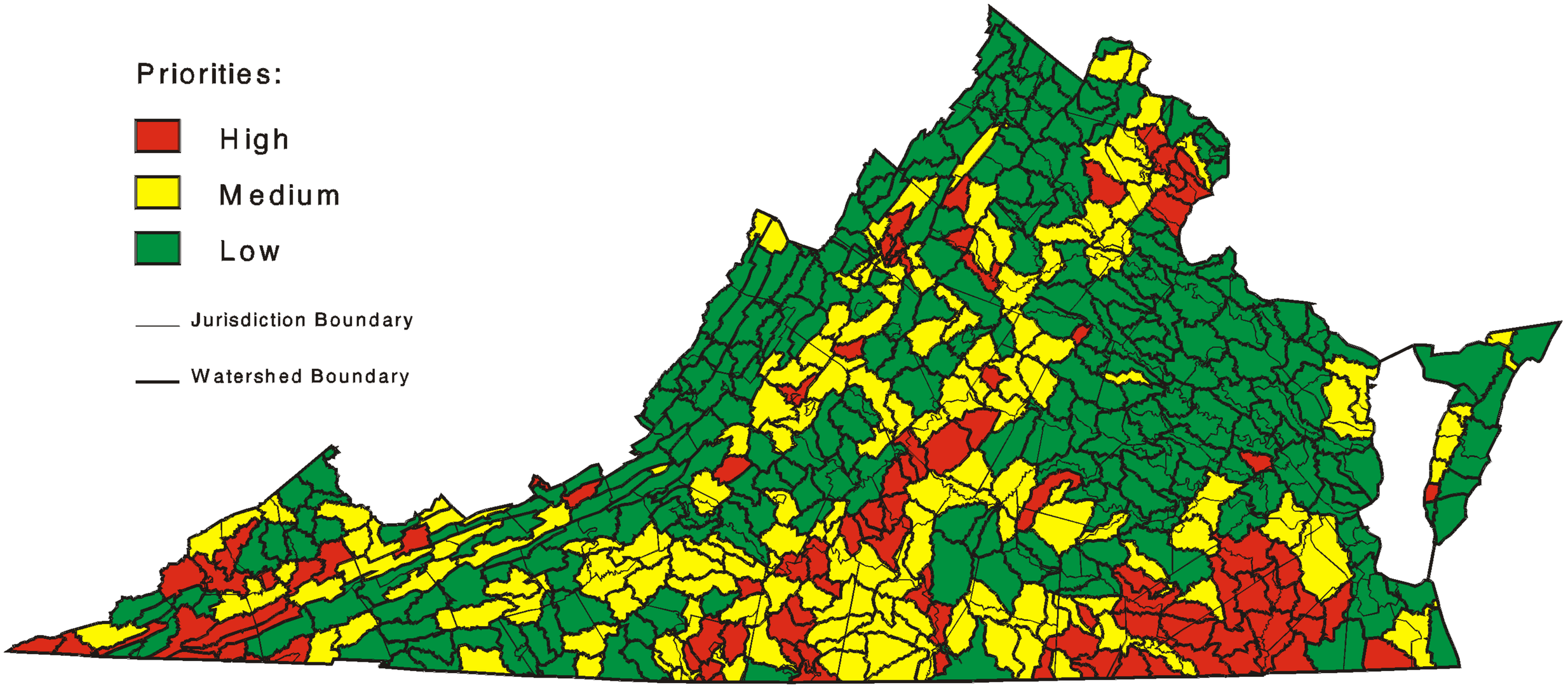
Figure 4.1-11

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Total Phosphorous Unit Area Load Ranking



NOTE:
Watersheds are being ranked here based on their unit area loading rates, such as on a load per hectare basis. This prevents the size of the watersheds from overly influencing load rankings.

DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

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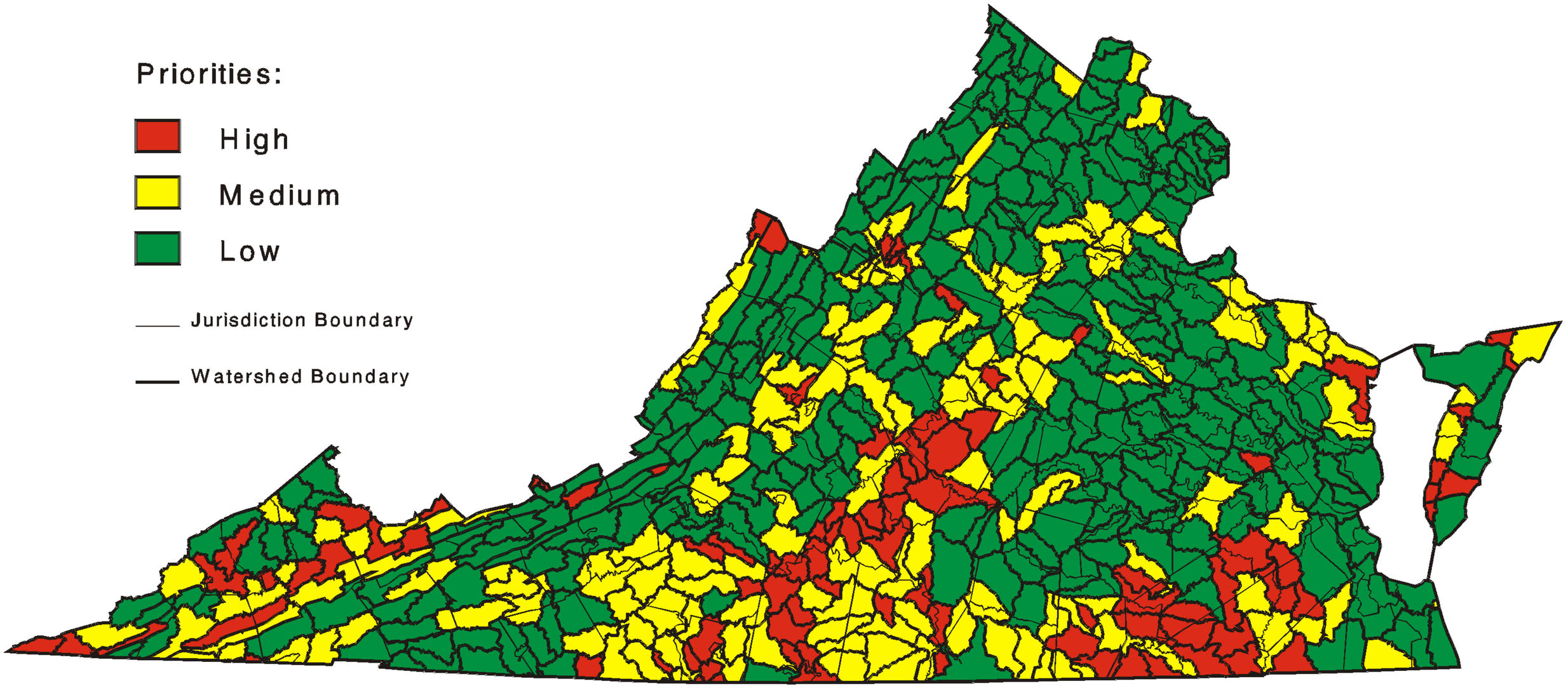
Figure 4.1-12

Virginia's 2004 Nonpoint Source Pollution Potential Priorities: Total Sediment Unit Area Load Ranking



NOTE:
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Watershed NPS Loads - VPI-BSE, VA DCR, & US EPA
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

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About 68 percent of the land area of Virginia is forested. Although forestland in general produces little to the NPS pollutant loads, certain forest disturbing activities such as tree harvesting, site preparation, and reforesting do make a load contribution. Due in large part to the extensiveness of forest lands in Virginia, about 17% of the total NPS nitrogen load in the Commonwealth may come from forests according to model output, as does over 30% of the total NPS phosphorous and sediment load.

The classification of land cover imagery can captures bare land and regrowth areas from the aforementioned forest activities. It also captures forestland being cleared due to other land disturbing activities as well. The Virginia DOF has been tracking such activities of the forest industry to facilitate the proper management of Virginia's forest resources relative to water quality. For this study the DCR staff endeavored to define the forest disturbing activities found in the imagery so as to associate the resulting (perhaps temporarily) barren lands with the most appropriate land use being used in the GWLF model runs. Transitionally barren land was found to more closely correlate to forest harvesting activities than to urban related activities. Therefore most transitionally barren land was associated with the forest land use as opposed to other types of barren lands, which were associated with urban land use. As a result, barren mine lands add to urban loads in this study while forestland disturbed by mining activities adds to the forest loads.

Whereas agricultural activities operate on a yearly or seasonal cycle on agricultural lands, a single cycle of forest harvesting, site preparation, and reforestation occurs over many years. Where the next cycle begins amongst existing forested lands is undetectable from previous land cover images, making the measure of forest disturbance for these activities more of a snapshot than a trend.

Factors in this assessment which affect the amount of loads reaching water from forest lands include the erodability of the soils, existence of disturbed forest lands, stream density, rainfall, existence of forest (silviculture) BMPs, soil saturation, and slope.

The ranked unit area loadings by hydrologic unit of nitrogen, phosphorus, and sediment from forestland uses are displayed in Figures 4.1-7, 4.1-8, and 4.1-9 respectively. The rankings are also listed in Table 4.1-3.

Total Loads Per NPS Pollutant

Calculated total nitrogen, total phosphorous, and total sediment unit area loads from all land uses combined are displayed in Figures 4.1-10, 4.1-11, and 4.1-12 respectively, and listed in Table 4.1-3. In the GWLF model as operated by BSE, total nitrogen is composed of septic nitrogen, groundwater nitrogen, dissolved nitrogen from various land uses, washoff of nitrogen from impervious surfaces, and sediment attached nitrogen. Total phosphorous is composed of septic phosphorous, groundwater phosphorous, dissolved phosphorous from various land uses, washoff of phosphorous from impervious surfaces, and sediment attached phosphorous. Total sediment is the sediment yield from all land uses.

The summing of NPS pollutant loads by land use into total NPS pollutant loads in this NPS assessment is simply the addition of values with equivalent units (kg/ha of nitrogen or phosphorous, Mg/ha of sediment). Accordingly, the relative weight of the estimated NPS pollutants coming from one land use versus another is directly comparable. This comparison shows that NPS pollutants from agricultural lands dominate the total NPS pollutant loads.

IMPAIRED WATERS

In accordance with US EPA guidance and protocol, the DEQ assembled a list of the water quality limited riverine, lacustrine, and estuarine waters of Virginia in 2002 (303d report). The final version of the 2002 list of water quality limited waters is the basis for the impaired waters portion of the 2004 NPS Assessment study. It will differ slightly from the results published in the 2002 305(b) Report, since only the draft 2002 303(d) Report was available at that time, and from other portions of this 305b report that may refer to waters on the 2004 list. The 2004 list was not available in time to perform for this report the spatial analysis required for NPS analysis.

Waters listed in the 303(d) do not meet one or more of the EPA's five designated uses for water.

Among the many defined attributes in the impaired waters database is the name of the impaired waters, the beginning and ending limits of the impaired portions, impairment causes, and impairment sources. Using this database information, a graphic depiction (layer) of the impaired waters was developed. Only waters listed by the DEQ staff as having NPS related sources or those waters not explicitly listed as having an NPS source but which (a) did not explicitly list any other sources, and either (b) listed possible agriculture related impairment causes[5] or (c) correlated with DCR's areas of nonpoint sources, were considered in this analysis.

Waters in the impaired waters layer that are suspected of being impaired due to non-point sources were divided by the hydrologic unit boundaries into segments by unit to allow for the summation of impaired water lengths or areas by these units. The same process performed on all waters in the state determined the total available miles of riverine, acres of lacustrine, and square miles of estuarine waters per hydrologic unit to compare against the impaired portions.

Riverine Impairments

Summed lengths of impaired riverine water features in 2002 as miles per hydrologic unit were compared to the total miles of riverine systems available per unit to determine the percentage of the available riverine water miles per unit that were impaired. For ranking purposes the highest 10 percent of those percentages were assigned the highest NPS rank for riverine impairments. The next 20 percent were assigned the medium rank, and the others were assigned the lowest rank. The rankings of hydrologic units for impaired riverine waters are displayed in Figure 4.1-13 and listed in Table 4.1-3.

Estuarine Impairments

Since most of the impaired main stem estuarine water bodies in Virginia have listed impairment causes that are not considered to be due to (with any significance) practices occurring in the watershed that the main stems flow through, the estuarine waters were divided into the categories Amain stem≅ and Anon main stem≅. Main stem impairment sources are considered to be more broadly dispersed in the basin, including the upstream portions of the basin that are beyond the estuarine system. To prevent the implication that the hydrologic units through which these main stem estuarine waters flow are responsible for the large amount of impaired estuarine waters in their domain, and erroneously ranking them accordingly, main stem estuarine waters were not included in the summing of impaired or available estuarine waters per unit. Summed areas of non main stem impaired estuarine waters in 2002 as square miles per hydrologic unit were compared to the total square miles of non main stem estuarine waters available per unit to determine the percentage of non main stem estuarine waters in a unit that were impaired.

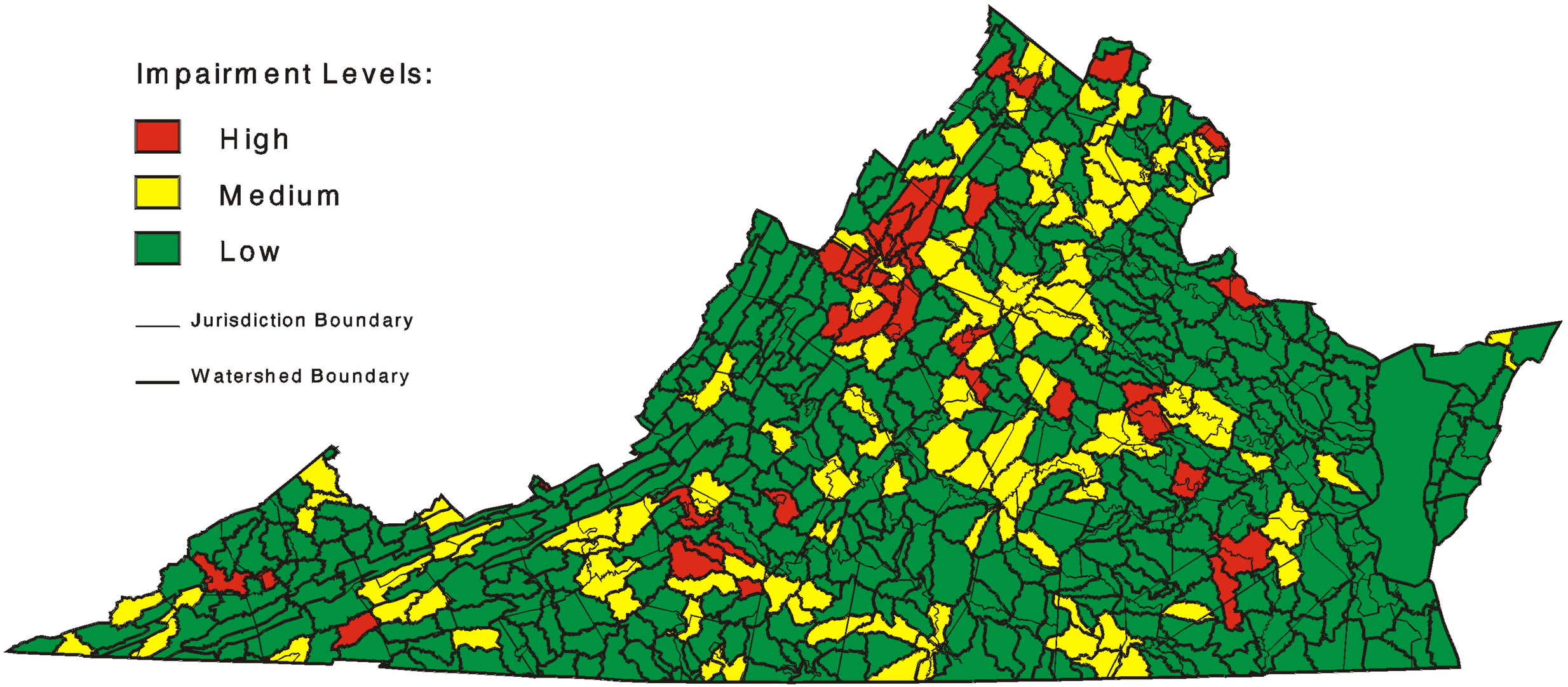
Most of the 494 watersheds in Virginia do not contain estuarine waters. With the further disqualification of those that contain only main stem estuarine waters, only 66 watersheds were included in the ranking of impaired estuarine waters.

Of the hydrologic units included in the impaired estuarine waters ranking process, about 30% contained some impaired non-main stem estuarine waters. A clear gap existed in the percentage values such that all units with more than 50% impaired waters were ranked high and the other units were ranked medium. Watersheds with no impaired non-main stem estuarine waters were assigned the lowest rank.

[5] This included all fecal causes of unknown sources since approximately 90% of all fecal problems are surmised to be due to agricultural or natural animal loadings. Similarly, because about 85% of benthic impairments are believed to be sediment related, and because DEQ personnel are more likely to know and document point sources of benthic impairments, all benthic impairments of unknown sources are considered to be NPS related. Impairments with nutrient sources were also included.

Figure 4.1-13

Virginia's 2004 Nonpoint Source Pollution Priorities: NPS Impaired Rivers Ranking



NOTE:
Only NPS impaired riverine waters from Part 1A and Part 1C of the Final 2002 303d have been used in this analysis and subsequent ranking.

DATA SOURCES
Watershed Boundaries - VA DCR & USDA-NRCS
Impaired Waters Determinations - VA DEQ
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

KM

0 30 60 90

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Figure 4.1-14

Virginia's 2004 Nonpoint Source Pollution Priorities: NPS Impaired Estuaries Ranking

NOTE:
Only NPS impaired non-mainstem estuarine waters from Part 1A and Part 1C of the Final 2002 303d have been used in this analysis and subsequent ranking. Watersheds shaded as "No Estuaries" contained either zero square miles of estuaries or (in the case of the Chesapeake Bay) only mainstem estuaries.

DATA SOURCES
Watershed Boundaries - VA DCR & USDA-NRCS
Impaired Waters Determinations - VA DEQ
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

KM

0 30 60 90

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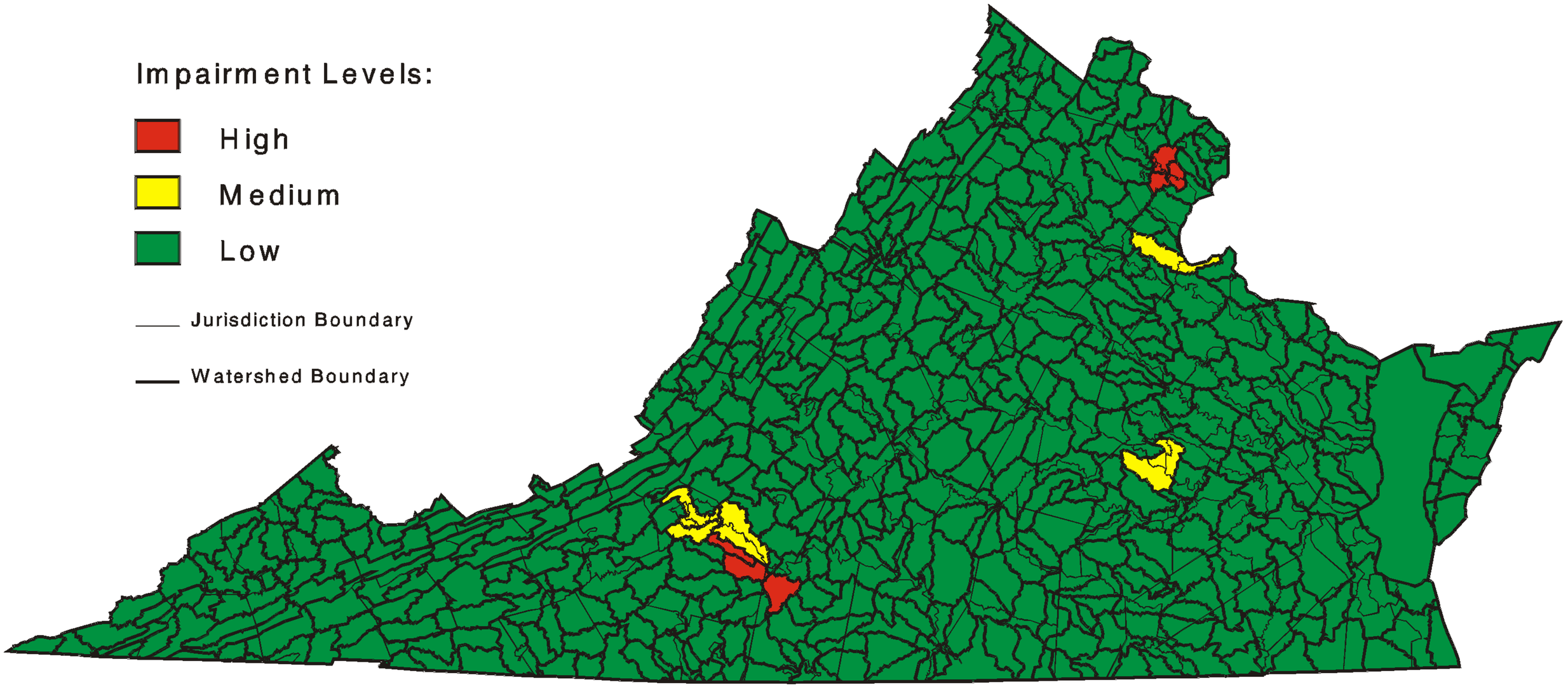
Figure 4.1-15

Virginia's 2004 Nonpoint Source Pollution Priorities: NPS Impaired Lakes Ranking



NOTE:
Only NPS impaired lake waters from Part 1A and Part 1C of the Final 2002 303d have been used in this analysis and subsequent ranking.

DATA SOURCES
Watershed Boundaries - VA DCR & USDA-NRCS
Impaired Waters Determinations - VA DEQ
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

KM

0 30 60 90

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The rankings of hydrologic units for impaired non-main stem estuarine waters are displayed in Figure 4.1-14 and listed in Table 4.1-3.

Lacustrine Impairments

Unlike the 1998 303(d) listing, the 2002 listing included impaired lake and reservoir waters. It was particularly necessary to divide impaired lake waters by hydrologic unit because some of the larger reservoirs in the state were impaired or contained impaired portions, and these large bodies of water spanned multiple hydrologic units. Summed areas of impaired lacustrine waters in 2002 as acres per hydrologic unit were compared to the total acres of lacustrine waters available per unit to determine the percentage of lake waters in a unit that were impaired.

The vast majority of the hydrologic units in Virginia contained no impaired lake or reservoir waters in 2002 and so were ranked low. Of those that did, a few had very minor percentages and were therefore also ranked low. Conversely, a few had significant impaired portions (>50%) and were therefore ranked high. All others were ranked medium. The rankings of hydrologic units for impaired lacustrine waters are displayed in Figure 4.1-15 and listed in Table 4.1-3.

BIOLOGICAL HEALTH

Also included In the 2004 NPS Assessment and Prioritization study is information from VDH on public surface water sources and their protection zones, and an evaluation of the health of aquatic species in the state=s waters by the CES at VCU. Both of these components were used in the 2002 NPS Assessment and Prioritization study and are repeated here without change. They provide an additional means to prioritize water quality protection - the protection of the sources of public drinking water and of natural aquatic communities, respectively.

Public Source Water Protection

As part of their Source Water Area Protection (SWAP) Program, the VDH determined the area upstream of public surface water intakes that must be investigated for threats to water quality. The most immediate area of their concern is referred to as the Zone 1 for each intake. Zone 1 areas extend out to a 5-mile radius upstream from a water supply intake or 5 miles around a lake containing an intake, without crossing watershed boundaries except those upstream. The population served by an intake, provided by VDH, and the portion of a hydrologic unit that is within a Zone 1 area has been used by DCR to calculate the concentration of persons served per unit by these public surface water supplies. The concentration values serve as a measure of the importance of high water quality by hydrologic unit for public drinking water supply protection. The categorized values are displayed in Figure 4.1-16 and listed in Table 4.1-3. Concentration values are the summation by hydrologic unit of all Zone 1 areas or combinations of Zone 1 areas in that unit times one one-thousandth of the effective population each serves. In cases where a municipality owned several intakes, the single recording of population served was divided amongst each intake to create an effective population served. In cases of overlapping intake reaches the effective population of each reach was summed for the portion of overlap.

Many hydrologic units contained no Zone 1 protection zones or portions of Zone 1 protection zones. The vast majority of those with some Zone 1 content had low levels (< .38) of the calculated measure for concentrations of people served within a watershed. Of the remaining units, a few had significantly higher value measures (> 92) and were therefore classified as AVery High≅. The rest were divided among a moderate category (.38-2.4) and a high category (2.5-91).

Aquatic Species Measures

The presence or absence of certain aquatic species can serve as an indication of the overall quality of a particular waterway. They can also indicate where the most biological damage can occur from water quality degradation. Accordingly, the NPS Assessment and Prioritization study provides a ranking of hydrologic units for stream-dependent living resources (including fish, mollusks, and crayfish) using a multi-metric index calculated by the CES at VCU. These indexes (referred to as AminiMIBI≅ B a minimized version of the Modified Index of Biological Integrity) were calculated by the CES using

databases originally developed by DCR, the VDGIF, and VCU. The DCR database contained information for approximately 600 fish records, representing over 50 species, and over 1,300 mollusk records, representing almost 50 species. The VDGIF database contained information for over 135,000 fish records, representing over 220 unique species, and close to 7,000 mollusk records. Additionally, the VCU dataset contained information for over 5,500 fish records. By assigning a hydrologic unit code to each of the recorded species in the various databases, metric scores by unit were developed for each of 6 metrics. These metrics are as follows:

Metric 1 - Taxonomic Richness: refers to the total number of unique species found in a unit.
Metric 2 - Native Species Richness: refers to the number of indigenous (local) species present in a unit.
Metric 3 - Number of Rare, Threatened and Endangered Species: refers to the number of species that are considered rare, threatened or endangered due to their low population levels that are present in a unit.
Metric 4 - Number of Non-indigenous Species: refers to the number of non-native species present in a unit. These are introduced species that would not normally be found in this particular location.
Metric 5 - Number of Critical Species: refers to the number of species found in a unit that are considered critical because of some important role that they play, such as being a food source or major recreational fishery.
Metric 6 - Number of Tolerant Species: refers to the number of species found in a unit that are tolerant to degraded stream conditions and can survive even in these sub-optimal conditions.

A score for each metric per hydrologic unit was assigned by the CES. A score of zero was given if insufficient data was available. Metrics 4 and 6 were reversed in the scoring, so that a low value for either of these metrics would receive a high score. Lower values are more desirable in metrics 4 and 6 because a high number of non-native species and/or a high number of species that are tolerant to stream degradation are less desirable characteristics for a stream. The scores for each metric for each unit were totaled to give an overall total miniMIBI score per hydrologic unit. A category value of High (score of 5), Medium (score of 3), or Low (score of 1) was assigned on a per basin basis based on the total miniMIBI score. Summed scores per hydrologic unit were thusly tiered relative only to the summed scores of the other units in the same basin. The total miniMIBI scores are used to place each hydrologic unit into ranked categories reflecting biotic integrity and resource importance.

Figure 4.1-17 displays, and Table 4.1-3 lists, the categorization of the miniMIBI scores by hydrologic unit. Since there were 6 metrics, and a maximum score of 5 could be obtained for each metric, the overall maximum score a unit could receive was 30 (6 x 5). A majority (197) of the total miniMIBI scores were 14. The 180 hydrologic units with total miniMIBI scores below this average may represent waters with some degree of degradation, but they may also reflect waters where insufficient studies and inventories have occurred. This latter condition is particularly true for coastal watersheds, and is being addressed in further cooperative efforts by the CES, VDGIF, and DCR. The hydrologic units with miniMIBI scores above 14 are divided here into two categories based on their Metric 3 scores. Since the occurrence of rare, threatened, and endangered species is of particular importance to DCR and the VDGIF, units with a maximum score for Metric 3 have been highlighted from those with less than a maximum Metric 3 score.

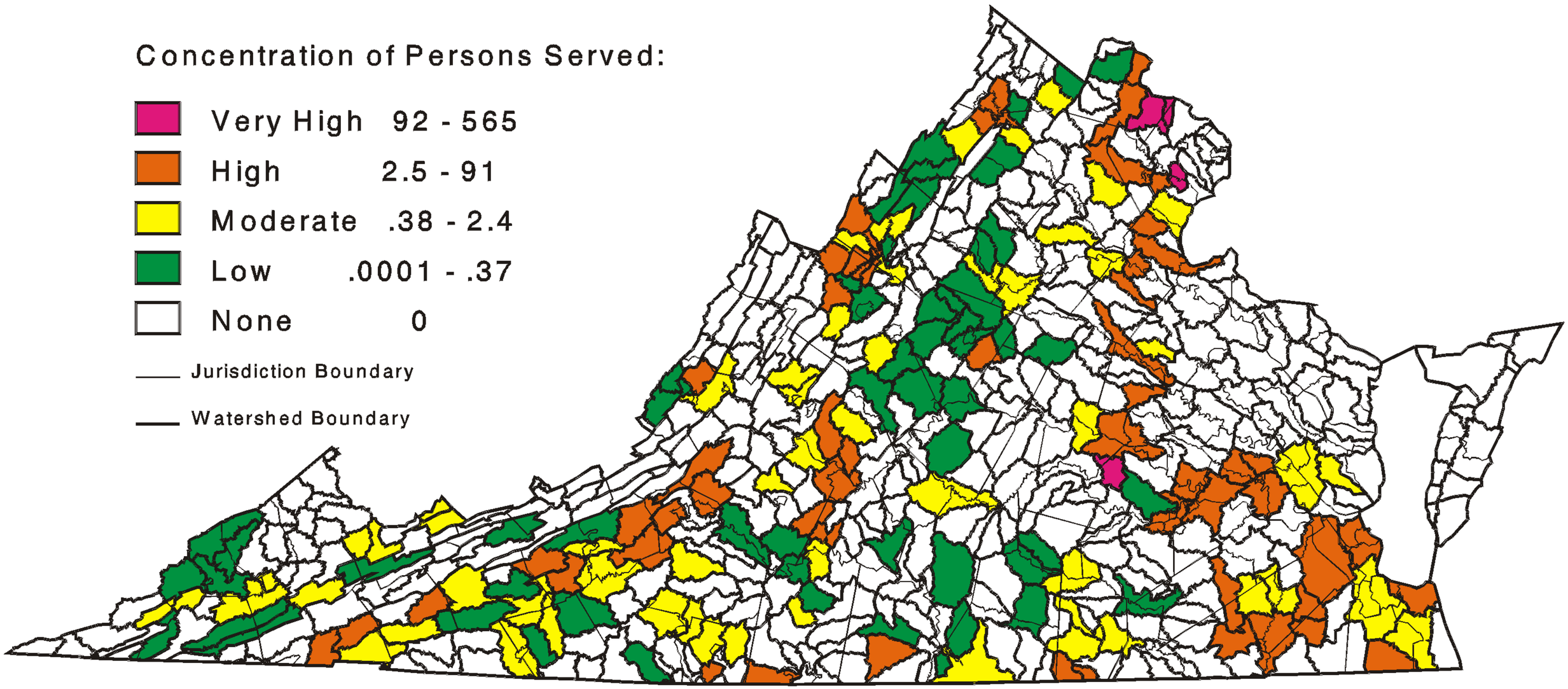
While the maintenance or enhancement of water quality for the protection of all native aquatic life is the preferred goal, the aquatic species priorities shown should help direct NPS pollution mitigation efforts and other water quality improvement projects toward hydrologic units with the most important aquatic resources.

NPS REDUCTION ACTIVITIES

Efforts to reduce NPS pollution in Virginia have been undertaken by a full range of government agencies - federal, state, regional, and local, as well as by citizen action. In many cases the activities are cooperatively performed and funded. The Annual 2002 Virginia Nonpoint Source Pollution Program Report, found at www.dcr.state.va.us/sw/, contains descriptions of the cooperative NPS reduction activities. Most of these efforts target particular watersheds. Among them, and elaborated on here for a

Figure 4.1-16

Virginia's 2004 Nonpoint Source Source Water Protection Priorities: Population Served by Public Surface Water Supply



NOTE:
Concentration of population served by source water intakes per watershed was calcluated by dividing the population served in all Zone 1 reaches of a watershed by 1000 and multiplying the results by the percent of area covered by all Zone 1 reaches of that watershed.

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DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
Source Water Protection Rankings - VA DOH & VA DCR
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000

KM
0 30 60 90

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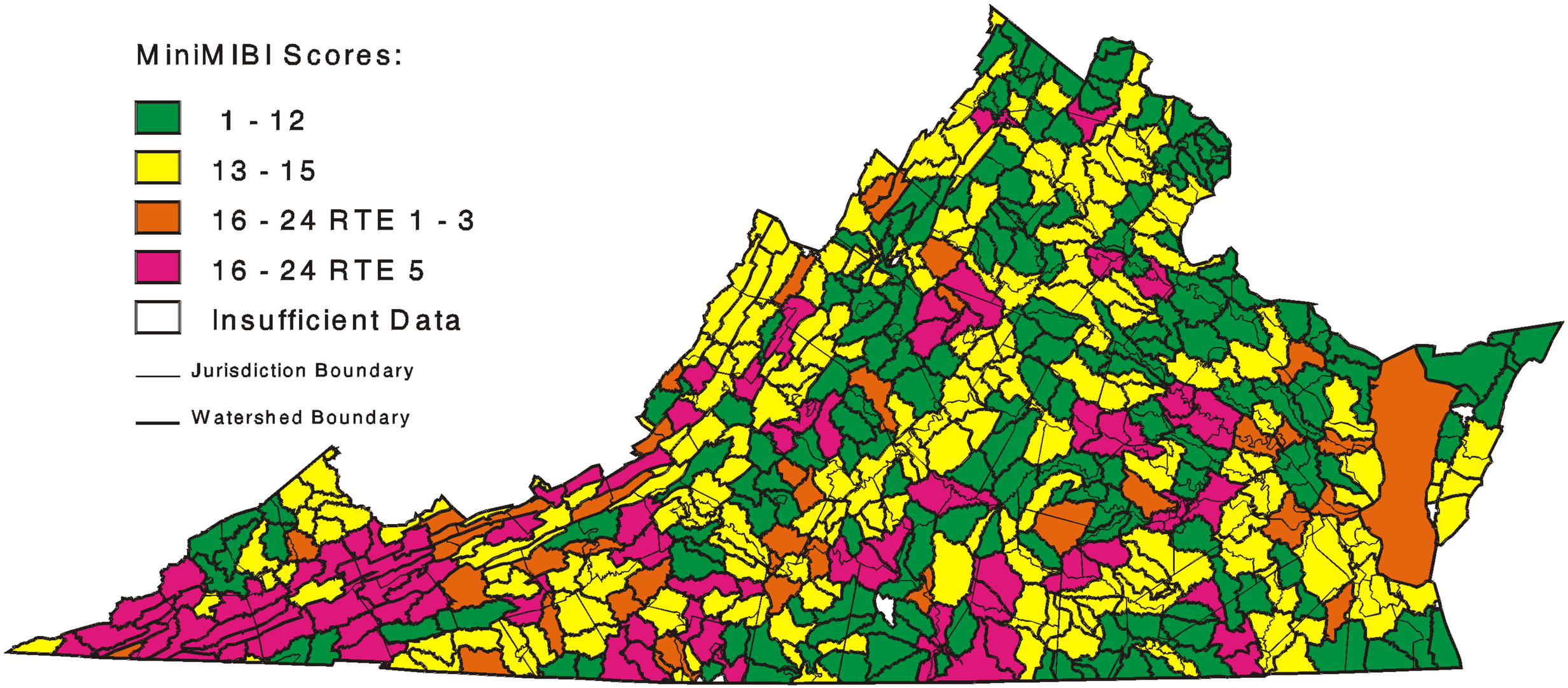
Figure 4.1-17

Virginia's 2004 Nonpoint Source Aquatic Biological Priorities: Mini Modified Index of Biological Integrity Rank (MiniMIBI)



NOTE:
MiniMIBI values are the basis of ranking watersheds on this map. Watersheds receive either a 1, 3, or 5 score for each metric. Watersheds with MiniMIBI scores > 15 are further divided in this ranking by the metric values for the occurrence of rare, threatened, and endangered (RTE) species.

DATA SOURCES:
Watershed Boundaries - VA DCR & USDA-NRCS
MiniMIBI Scores - VCU-CES, VA DGIF, & VA DCR
Jurisdiction Boundaries - VA DCR

Scale 1: 3000000
KM
0 30 60 90

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basin level comparison, are the Total Maximum Daily Load (TMDL) studies and implementation, Tributary Strategies, cost share incentive programs for Best Management Practices (BMP), and incentives for the set aside of agricultural land.

Total Maximum Daily Loads

TMDLs, described earlier in this 305(b) report, are performed for waters that have been determined to be impaired and are so listed in the State=s 303(d) report. Waters are not listed as impaired, however, due to high concentrations of nitrogen, phosphorous, or sediment, but rather because they cannot support, or can only partially support, one or more of the five designated uses. This is because water quality standards do not exist for concentrations of these NPS pollutants. Nevertheless, certain impairment causes are primarily due to nonpoint source pollutants (see Impaired Waters in this chapter) and DEQ staff has often determined that there are nonpoint sources for these impairments.

Using the logic of the impaired waters rankings of the NPS Assessment study, all impairments for which one or more of the stages of a TMDL have begun were divided between those with and those without a nonpoint source. Most of the waters declared impaired in Virginia are, or are believed to be, impaired due to, or partially due to, nonpoint source pollution. Consequently, most of the TMDLs that are being undertaken have a nonpoint source component. These studies are focusing on identifying the sources of the impairment causes, quantifying the loadings of these sources to the water, and determining the reduction in loads needed in order to meet the use criteria. The development of an implementation plan is expected following the completion of a TMDL study for a particular watershed. Implementation of the plan's course of action then follows.

By the end of 2003 there were 59 completed TMDL studies for NPS impaired watersheds. Of these, 20 are having implementation plans developed at this time. There are 88 other TMDL studies underway on nonpoint source impaired watersheds. Table 4.1-4 lists these TMDLs by stage.

Whereas it is streams or water bodies that are listed as impaired, it is the watershed of those impaired stream segments and water bodies that are the focus of nonpoint source pollutant reduction activities. The hydrologic units listed in Table 4.1-4 are those that some portion of the listed impaired stream segments are within. Sometimes the entire area of the listed hydrologic unit is the watershed of the impaired stream segment, but often only a portion of that unit must be studied for a TMDL. Figure 4.1-18 shows the true TMDL study areas and thus gives a better indication of the geographic extent of where the work is being performed.

Agricultural Cost Share Program

The Virginia Agricultural Cost Share Program offers incentives to farmers and agricultural landowners to encourage the installation and use of a number of approved techniques (known as BMPs) for reducing agricultural related nonpoint source runoff. While the program aims to address nonpoint source pollutants statewide, specific hydrologic units are targeted based on the agricultural loads estimated from the NPS Assessment study (see Agricultural NPS Pollution Loads). Soil and Water Conservation Districts further target the practices to individual needs within their district within these load priority areas.

Funding for the implementation of these practices has been borne by the state and the federal government since the program=s inception in 1985. The number of installations increased in 2000 and 2001 with an increase of funding from the Water Quality Improvement Act (WQIA), but the WQIA Fund has not been funded in the past two years. Subsequently, installations have dropped. Table 4.1-5 contains the estimated NPS pollutant reductions by basin for 2002 and 2003, as well as the state=s costs to attain these reductions, from the Virginia Agricultural Cost Share Program alone. Other efforts, such as from the USDA, increase these reductions. Additional information on agricultural best management practices can be found at www.dcr.state.va.us/sw/costshar.htm

Conservation Reserve Enhancement Program

The USDA=s Conservation Reserve Program (CRP) provides incentives for the removal of

agricultural land from production to protect environmentally sensitive land alongside rivers and streams. The Virginia Conservation Reserve Enhancement Program (CREP) augments CRP by providing for additional set asides as well as by providing funding for land owner implementation of other conservation practices as well as for the purchase of conservation easements.

Most areas of the state qualify for CREP assistance. Table 4.1-5 contains the estimated reduction of nonpoint source pollutants by basin for 2002 and 2003, as well as the state=s costs to attain these reductions, from the Virginia CREP alone. The USDA=s CRP increases these reductions. Additional information on the Conservation Reserve Enhancement Program can be found at www.dcr.state.va.us/sw/crep.htm.

Table 4.1-5 BMP NPS Pollutant Reductions and Costs, Calendar Years 2002 & 2003

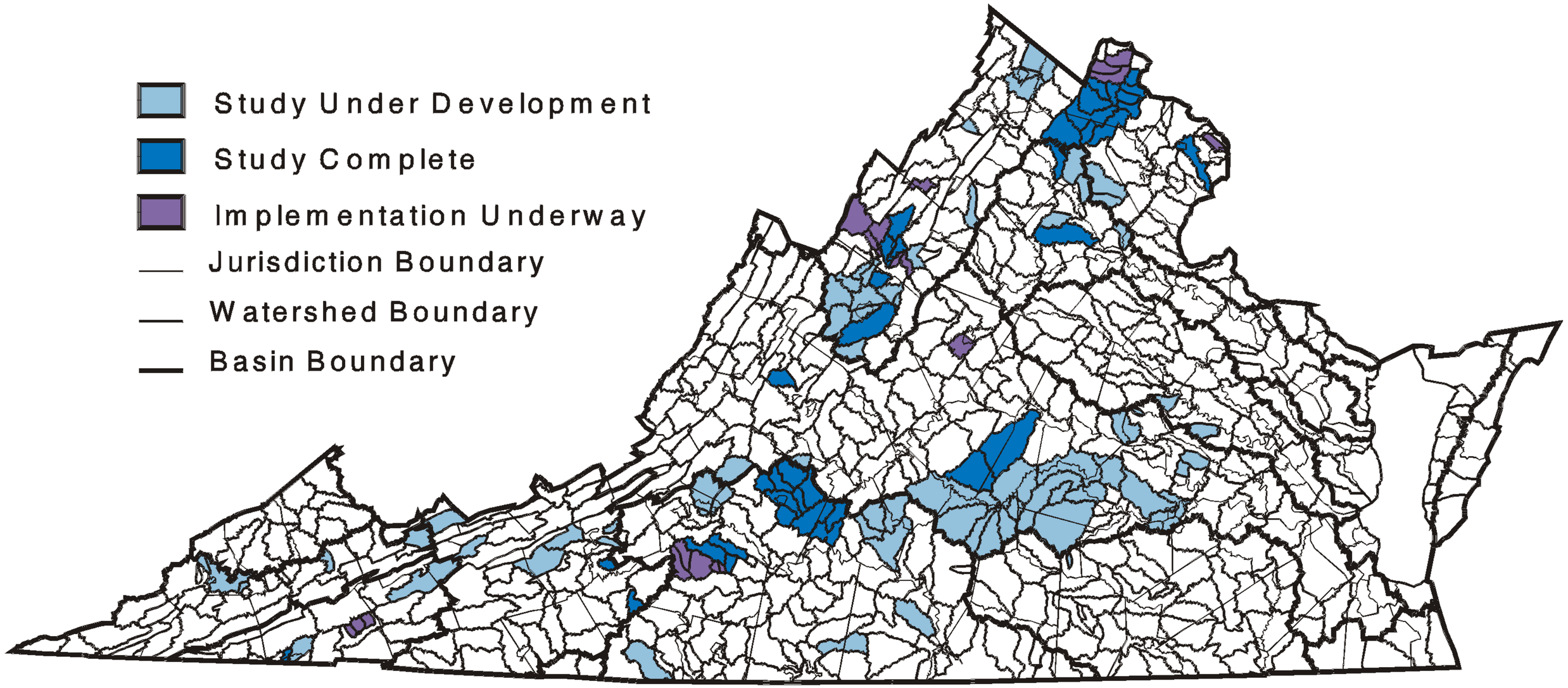
	Ag Cost Share Totals				CREP Totals			
BASIN	Tons SL Reduced	Lbs N Reduced	Lbs P Reduced	State Cost ($)	Tons SL Reduced	Lbs N Reduced	Lbs P Reduced	State Cost ($)
POTOMAC	30836	167750	26591	614032	441	2398	589	31136
SHENANDOAH	19832	107883	21669	1744128	6850	37263	6615	435792
RAPPAHANNOCK	31546	171612	30531	1105485	1289	7015	1029	78005
YORK	11683	63554	10919	522703	3854	20966	3111	606632
JAMES	36691	199597	37144	1210920	4197	22833	4794	539935
BAY COASTAL	66900	363938	91365	270910	353	1918	283	51782
OCEAN COASTAL	27922	151895	37033	65440	83	452	104	11797
ALBEMARLE SOUND	1471	8003	1471	39781	18	96	18	400
CHOWAN	7451	40533	10859	149856	1171	6373	1645	145051
ROANOKE	49336	268387	53354	165600	1912	10400	1900	153198
YADKIN	1115	6066	1115	6495	3514	19116	3629	357139
NEW	16742	91075	16012	216046	7583	41252	7554	165957
CLINCH/POWELL	9230	50212	9589	125504	242	1316	300	56084
HOLSTON	106806	581025	113985	201772	1574	8562	1894	237880
BIG SANDY	143	775	143	1500	14	76	14	158

Tributary Strategies

Tributary Strategies are basin wide water quality attainment plans. They are part of the State=s Chesapeake Bay Program commitment, and thus are described in that chapter of this 305(b) report. Plans are currently being updated for the James River Basin, Rappahannock River Basin, York River Basin, Potomac River Basin, and the Eastern Shore of Virginia. The goals of these plans both directly specify nonpoint source nutrient load reductions needed for water quality attainment and specify attainment measures that will require nonpoint source pollutant reductions. Consequently, significant amounts of nonpoint source pollutants must be reduced to achieve these plans, at considerable cost. More information on the Tributary Strategies, including their current status, is available at: www.naturalresources.virginia.gov/Initiatives/TributaryStrategies/index.cfm.

Table 4.1-18

Status of Virginia's NPS TMDLs as of 2004



NOTE:
TMDLS shown are those from the 2004 list and prior years.
Completed TMDLS are those currently approved.

DATA SOURCES:
Jurisdiction Boundaries - VA DCR
Watershed Boundaries - VA DCR & USDA-NRCS
TMDL Status - VA DCR & VA DEQ

Scale 1: 3000000

KM

0 30 60 90

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Table 4.1-2 Modeled Watersheds

Watershed-ID	Watershed Name
Lower Potomac River Subbasin	
Cataloging Unit 02070008	
A01	POTOMAC RIVER / PINEY RUN / DUTCHMAN CREEK
A02	CATOCTIN CREEK
A03	POTOMAC RIVER / LIMESTONE BRANCH
A04	UPPER GOOSE CREEK / GAP RUN
A05	MIDDLE GOOSE CREEK / PANTHER SKIN CREEK
A06	NORTH FORK GOOSE CREEK
A07	BEAVERDAM CREEK
A08	LOWER GOOSE CREEK / LITTLE RIVER
A09	POTOMAC RIVER / BROAD RUN
A10	SUGARLAND RUN
A11	POTOMAC RIVER / DIFFICULT RUN
Cataloging Unit 02070010	
A12	POTOMAC RIVER / FOURMILE RUN / PIMMIT RUN
A13	CAMERON RUN
A14	POTOMAC RIVER / DOGUE CREEK / LITTLE HUNTING CREEK
A15	ACCOTINK CREEK
A16	POHICK CREEK
A17	UPPER CEDAR RUN / LICKING RUN
A18	LOWER CEDAR RUN / TOWN RUN
A19	BROAD RUN / KETTLE RUN
A20	UPPER OCCOQUAN RIVER / LAKE JACKSON
A21	UPPER BULL RUN / LITTLE BULL RUN
A22	CUB RUN
A23	LOWER BULL RUN / POPES HEAD CREEK
A24	OCCOQUAN RIVER - RESERVOIR
A25	POTOMAC RIVER / LOWER OCCOQUAN RIVER / NEABSCO CREEK
Cataloging Unit 02070011	
A26	POTOMAC RIVER / QUANTICO CREEK / CHOPAWAMSIC CREEK
A27	UPPER AQUIA CREEK / BEAVERDAM RUN
A28	LOWER AQUIA CREEK
Cataloging Unit 02070011 (continued)	
A29	POTOMAC RIVER / POTOMAC CREEK
A30	POTOMAC RIVER / UPPER MACHODOC CREEK
A31	POTOMAC RIVER / MATTOX CREEK / POPES CREEK / ROSIER CREEK
A32	POTOMAC RIVER / NOMINI CREEK / LOWER MACHODOC CREEK
A33	POTOMAC RIVER / YEOCOMICO RIVER
A34	POTOMAC RIVER / COAN RIVER / LITTLE WICOMICO RIVER
Upper Potomac River Subbasin	
Cataloging Unit 02070001	
B01	UPPER NORTH FORK SOUTH BRANCH POTOMAC RIVER / LAUREL FORK
B02	UPPER SOUTH BRANCH POTOMAC RIVER
B03	UPPER SOUTH FORK SOUTH BRANCH POTOMAC RIVER
B04	SLEEPY CREEK
B05	UPPER BACK CREEK / ISAACS CREEK
B06	HOGUE CREEK
B07	LOWER BACK CREEK / BRUSH CREEK / BABBS RUN
B08	UPPER OPEQUON CREEK
B09	LOWER OPEQUON CREEK
Shenandoah River Subbasin	
Cataloging Unit 02070005	
B10	UPPER MIDDLE RIVER
B11	MIDDLE RIVER / JENNINGS BRANCH
B12	MIDDLE RIVER / LEWIS CREEK
B13	MOFFETT CREEK
B14	CHRISTIANS CREEK
B15	LOWER MIDDLE RIVER
B16	UPPER NORTH RIVER
B17	MIDDLE NORTH RIVER
B18	BRIERY BRANCH
B19	MOSSY CREEK
B20	UPPER DRY RIVER
B21	LOWER DRY RIVER
B22	MUDDY CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02070005 (continued)

B23	LOWER NORTH RIVER
B24	LONG GLADE CREEK
B25	COOKS CREEK
B26	BLACKS RUN
B27	PLEASANT RUN
B28	NAKED CREEK
B29	MILL CREEK
B30	UPPER SOUTH RIVER
B31	MIDDLE SOUTH RIVER / BACK CREEK
B32	LOWER SOUTH RIVER
B33	UPPER SOUTH FORK SHENANDOAH RIVER
B34	CUB RUN
B35	SOUTH FORK SHENANDOAH RIVER / ELK RUN / BOONE RUN
B36	NAKED CREEK
B37	SOUTH FORK SHENANDOAH RIVER / CUB RUN
B38	SOUTH FORK SHENANDOAH RIVER / MILL CREEK
B39	HAWKSBILL CREEK
B40	SOUTH FORK SHENANDOAH RIVER / GOONEY RUN
B41	LOWER SOUTH FORK SHENANDOAH RIVER

Cataloging Unit 02070006

B42	UPPER NORTH FORK SHENANDOAH RIVER / GERMAN RIVER
B43	NORTH FORK SHENANDOAH RIVER / LITTLE DRY RIVER
B44	NORTH FORK SHENANDOAH RIVER / SHOEMAKER RIVER
B45	NORTH FORK SHENANDOAH RIVER / HOLMANS CREEK
B46	LINVILLE CREEK
B47	SMITH CREEK
B48	NORTH FORK SHENANDOAH RIVER / MILL CREEK
B49	STONY CREEK
B50	NORTH FORK SHENANDOAH RIVER / NARROW PASSAGE CREEK
B51	LOWER NORTH FORK SHENANDOAH RIVER / TUMBLING RUN
B52	UPPER CEDAR CREEK
B53	LOWER CEDAR CREEK
B54	PASSAGE CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02070007

B55	UPPER SHENANDOAH RIVER
B56	CROOKED RUN
B57	SHENANDOAH RIVER / SPOUT RUN
B58	LOWER SHENANDOAH RIVER

Chesapeake Bay Coastal Subbasin

Cataloging Unit 02080102

C01	CHESAPEAKE BAY / GREAT WICOMICO RIVER
C02	DRAGON SWAMP
C03	PIANKATANK RIVER
C04	CHESAPEAKE BAY / EAST RIVER / NORTH RIVER
C05	WARE RIVER
C06	CHESAPEAKE BAY / SEVERN RIVER

Cataloging Unit 02080108

C07	CHESAPEAKE BAY / BACK RIVER / POQUOSON RIVER
C08	LYNNHAVEN RIVER / LITTLE CREEK
D07	RUDEE INLET

Cataloging Unit 02060009

C09	POCOMOKE RIVER / PITTS CREEK

Cataloging Unit 02080109

C10	CHESAPEAKE BAY / HOLDENS CREEK
C11	CHESAPEAKE BAY / ONANCOCK CREEK
C12	PUNGOTEAGUE CREEK
C13	NANDUA CREEK / OCCOHANNOCK CREEK / NASSAWADOX CREEK
C14	CHESAPEAKE BAY / HUNGARS CREEK
C15	CHERRYSTONE INLET / KINGS CREEK
C16	CHESAPEAKE BAY / OLD PLANTATION CREEK

Atlantic Ocean Coastal Subbasin

Cataloging Unit 02060010

D01	CHINCOTEAGUE BAY / LITTLE MOSQUITO CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02080110
- D02 ASSAWOMAN CREEK
- D03 METOMKIN BAY / BURTONS BAY
- D04 HOG ISLAND BAY / MACHIPONGO RIVER
- D05 OUTLET BAY / RAMSHORN BAY
- D06 MAGOTHY BAY / MOCKHORN BAY
- D07 (see 02080108)

Rappahannock River Basin

Cataloging Unit 02080103
- E01 UPPER RAPPAHANNOCK RIVER / THUMB RUN / JORDAN RIVER
- E02 RAPPAHANNOCK RIVER / CARTER RUN / GREAT RUN
- E03 HUGHES RIVER
- E04 UPPER HAZEL RIVER
- E05 UPPER THORNTON RIVER
- E06 LOWER THORNTON RIVER
- E07 LOWER HAZEL RIVER / MUDDY RUN / INDIAN RUN
- E08 RAPPAHANNOCK RIVER / MARSH RUN
- E09 MOUNTAIN RUN
- E10 RAPPAHANNOCK RIVER / DEEP RUN / ROCK RUN
- E11 UPPER RAPIDAN RIVER / CONWAY RIVER
- E12 RAPIDAN RIVER / SOUTH RIVER
- E13 RAPIDAN RIVER / BLUE RUN / BEAUTIFUL RUN
- E14 UPPER ROBINSON RIVER / WHITE OAK RUN
- E15 LOWER ROBINSON RIVER / CROOKED RUN / DEEP RUN
- E16 RAPIDAN RIVER / CEDAR RUN
- E17 RAPIDAN RIVER / MINE RUN / MOUNTAIN RUN
- E18 LOWER RAPIDAN RIVER

Cataloging Unit 02080104
- E19 RAPPAHANNOCK RIVER / MOTTS RUN
- E20 RAPPAHANNOCK RIVER / MASSAPONAX CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02080104 (continued)
- E21 RAPPAHANNOCK RIVER / MILL CREEK / GOLDENVALE CREEK
- E22 RAPPAHANNOCK RIVER / OCCUPACIA CREEK / PEEDEE CREEK
- E23 RAPPAHANNOCK RIVER / CATPOINT CREEK / PISCATAWAY CREEK
- E24 RAPPAHANNOCK RIVER / TOTUSKEY CREEK
- E25 RAPPAHANNOCK RIVER / LAGRANGE CREEK / LANCASTER CREEK
- E26 LOWER RAPPAHANNOCK RIVER / CORROTOMAN RIVER

York River Basin

Cataloging Unit 02080106
- F01 UPPER SOUTH ANNA RIVER
- F02 SOUTH ANNA RIVER / ROUNDABOUT CREEK
- F03 SOUTH ANNA RIVER / TAYLORS CREEK
- F04 LOWER SOUTH ANNA RIVER
- F05 NEWFOUND RIVER
- F06 UPPER NORTH ANNA RIVER
- F07 LAKE ANNA / PAMUNKEY CREEK
- F08 CONTRARY CREEK
- F09 LOWER NORTH ANNA RIVER / NORTHEAST CREEK
- F10 UPPER LITTLE RIVER
- F11 LOWER LITTLE RIVER
- F12 UPPER PAMUNKEY RIVER / MECHUMPS CREEK
- F13 MIDDLE PAMUNKEY RIVER / BLACK CREEK / TOTOPOTOMOY CREEK
- F14 LOWER PAMUNKEY RIVER

Cataloging Unit 02080105
- F15 NI RIVER
- F16 PO RIVER
- F17 UPPER MATTAPONI RIVER / PONI RIVER
- F18 MATTA RIVER
- F19 SOUTH RIVER
- F20 POLECAT CREEK
- F21 MATTAPONI RIVER / HERRING CREEK / CHAPEL CREEK
- F22 MARACOSSIC CREEK / BEVERLY RUN
- F23 MATTAPONI RIVER / GARNETTS CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02080105 (continued)
- F24 MATTAPONI RIVER / COURTHOUSE CREEK
- F25 LOWER MATTAPONI RIVER

Cataloging Unit 02080107
- F26 UPPER YORK RIVER / POROPOTANK RIVER / QUEEN CREEK / WARE CREEK
- F27 LOWER YORK RIVER / CARTER CREEK / KING CREEK

James River Basin

Cataloging Unit 02080206
- G01 JAMES RIVER / FALLING CREEK / PROCTORS CREEK
- G02 JAMES RIVER / TURKEY ISLAND CREEK / FOURMILE CREEK
- G03 JAMES RIVER / POWELL CREEK / WEST RUN / BAILEY CREEK
- G04 JAMES RIVER / WARDS CREEK / UPPER CHIPPOKES CREEK
- G05 UPPER CHICKAHOMINY RIVER / UPHAM BROOK / STONY RUN
- G06 CHICKAHOMINY RIVER / WHITEOAK SWAMP / BEAVERDAM CREEK
- G07 CHICKAHOMINY RIVER / RUMLEY MARSH
- G08 LOWER CHICKAHOMINY RIVER / MORRIS CREEK / LOWER DIASCUND CREEK
- G09 UPPER DIASCUND CREEK / DIASCUND CREEK RESERVOIR
- G10 JAMES RIVER / POWHATAN CREEK / GRAYS CREEK
- G11 JAMES RIVER / PAGEN RIVER / WARWICK RIVER / CHUCKATUCK CREEK

Cataloging Unit 02080208
- G12 SPEIGHTS RUN / LAKE COHOON / LAKE MEADE / LAKE KILBY
- G13 NANSEMOND RIVER / BENNETT CREEK
- G14 WESTERN BRANCH RESERVOIR
- G15 HAMPTON ROADS / ELIZABETH RIVER

Cataloging Unit 02080203
- H01 JAMES RIVER / REED CREEK
- H02 PEDLAR RIVER
- H03 JAMES RIVER / BLACKWATER CREEK / IVY CREEK
- H04 HARRIS CREEK
- H05 JAMES RIVER / BEAVER CREEK / BECK CREEK
- H06 WRECK ISLAND CREEK

Cataloging Unit 02080203 (continued)
- H07 BENT CREEK
- H08 JAMES RIVER / DAVID CREEK
- H09 UPPER TYE RIVER
- H10 PINEY RIVER
- H11 UPPER BUFFALO RIVER
- H12 LOWER BUFFALO RIVER
- H13 LOWER TYE RIVER / RUCKER RUN
- H14 JAMES RIVER / SYCAMORE CREEK
- H15 NORTH FORK ROCKFISH RIVER / SOUTH FORK ROCKFISH RIVER
- H16 LOWER ROCKFISH RIVER
- H17 JAMES RIVER / TOTIER CREEK / ROCK ISLAND CREEK
- H18 NORTH FORK HARDWARE RIVER / SOUTH FORK HARDWARE RIVER
- H19 HARDWARE RIVER
- H20 JAMES RIVER / BEAR GARDEN CREEK / SOUTH CREEK
- H21 UPPER SLATE RIVER
- H22 LOWER SLATE RIVER

Cataloging Unit 02080204
- H23 MECHUMS RIVER
- H24 MOORMANS RIVER
- H25 BUCK MOUNTAIN CREEK
- H26 SOUTH FORK RIVANNA RIVER / IVY CREEK
- H27 NORTH FORK RIVANNA RIVER / SWIFT RUN / PREDDY CREEK
- H28 UPPER RIVANNA RIVER / MOORES CREEK
- H29 MIDDLE RIVANNA RIVER / BUCK ISLAND CREEK
- H30 MECHUNK CREEK
- H31 LOWER RIVANNA RIVER / BALLINGER CREEK
- H32 CUNNINGHAM CREEK
- H33 JAMES RIVER / DEEP CREEK / MUDDY CREEK
- H34 BYRD CREEK
- H35 UPPER WILLIS RIVER
- H36 LOWER WILLIS RIVER
- H37 BIG LICKINGHOLE CREEK
- H38 JAMES RIVER / BEAVERDAM CREEK / FINE CREEK
- H39 JAMES RIVER / TUCKAHOE CREEK / NORWOOD CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02080201
- I01 UPPER JACKSON RIVER
- I02 BACK CREEK
- I03 LAKE MOOMAW / HUGHES DRAFT
- I04 JACKSON RIVER / FALLING SPRING CREEK
- I05 CEDAR CREEK
- I06 COVE CREEK / SWEET SPRINGS CREEK
- I07 DUNLAP CREEK
- I08 OGLE CREEK
- I09 LOWER JACKSON RIVER / WILSON CREEK / KARNES CREEK
- I10 UPPER POTTS CREEK
- I11 LOWER POTTS CREEK
- I12 UPPER COWPASTURE RIVER
- I13 BULLPASTURE RIVER
- I14 COWPASTURE RIVER / THOMPSON CREEK / DRY RUN
- I15 STUART RUN
- I16 COWPASTURE RIVER / MILL CREEK
- I17 LOWER COWPASTURE RIVER / SIMPSON CREEK / PADS CREEK
- I18 UPPER JAMES RIVER / SINKING CREEK / MILL CREEK
- I19 UPPER CRAIG CREEK
- I20 MEADOW CREEK
- I21 JOHNS CREEK
- I22 LOWER CRAIG CREEK / PATTERSON CREEK / LOWER BARBOURS CREEK
- I23 UPPER BARBOURS CREEK
- I24 JAMES RIVER / LAPSLEY RUN
- I25 CATAWBA CREEK
- I26 LOONEY CREEK / MILL CREEK
- I27 JAMES RIVER / JENNINGS CREEK
- I28 JAMES RIVER / ELK CREEK / CEDAR CREEK

Watershed-ID	Watershed Name

Cataloging Unit 02080202
- I29 UPPER CALFPASTURE RIVER
- I30 LOWER CALFPASTURE RIVER / MILL CREEK
- I31 BRATTONS RUN
- I32 LITTLE CALFPASTURE RIVER
- I33 UPPER MAURY RIVER / KERRS CREEK
- I34 HAYS CREEK
- I35 MIDDLE MAURY RIVER / MILL CREEK
- I36 SOUTH RIVER
- I37 LOWER MAURY RIVER / POAGUE RUN
- I38 BUFFALO CREEK

Cataloging Unit 02080207
- J01 UPPER APPOMATTOX RIVER
- J02 BUFFALO CREEK / SPRING CREEK
- J03 SANDY RIVER
- J04 BUSH RIVER
- J05 BRIERY CREEK
- J06 APPOMATTOX RIVER / BIG GUINEA CREEK / SAYLERS CREEK
- J07 APPOMATTOX RIVER / SKINQUARTER CREEK / ROCKY FORD CREEK
- J08 FLAT CREEK
- J09 NIBBS CREEK
- J10 APPOMATTOX RIVER / SMACKS CREEK / SAPPONY CREEK
- J11 DEEP CREEK
- J12 LAKE CHESDIN / WINTERPOCK CREEK / WINTICOMACK CREEK
- J13 NAMOZINE CREEK
- J14 LAKE CHESDIN / WHIPPONOCK CREEK
- J15 LOWER APPOMATTOX RIVER / ASHTON CREEK
- J16 UPPER SWIFT CREEK / SWIFT CREEK RESERVOIR
- J17 LOWER SWIFT CREEK

Chowan River Basin

Cataloging Unit 03010204
- K01 SOUTH MEHERRIN RIVER / MIDDLE MEHERRIN RIVER
- K02 NORTH MEHERRIN RIVER
- K03 UPPER MEHERRIN RIVER / FLAT ROCK CREEK / MASON CREEK

Watershed-ID	Watershed Name

Cataloging Unit 03010204 (continued)
- K04 MEHERRIN RIVER / STONY CREEK / TAYLORS CREEK
- K05 MEHERRIN RIVER / GENITO CREEK / ALLEN CREEK
- K06 GREAT CREEK
- K07 ROSES CREEK
- K08 MEHERRIN RIVER / REEDY CREEK
- K09 MEHERRIN RIVER / FALLING RUN
- K10 UPPER FONTAINE CREEK / RATTLESNAKE CREEK
- K11 MIDDLEFONTAINE CREEK / CATTAIL CREEK / BEAVERPOND CREEK
- K12 LOWER FONTAINE CREEK / MILL SWAMP
- K13 LOWER MEHERRIN RIVER / TARRARA CREEK / FLAT SWAMP

Cataloging Unit 03010201
- K14 UPPER NOTTOWAY RIVER / BIG HOUNDS CREEK
- K15 LITTLE NOTTOWAY RIVER
- K16 NOTTOWAY RIVER / TOMMEHETON CREEK / CROOKED CREEK
- K17 NOTTOWAY RIVER / WAQUA CREEK
- K18 STURGEON CREEK
- K19 NOTTOWAY RIVER / BUCKSKIN CREEK / HARRIS SWAMP
- K20 BUTTERWOOD CREEK / WHITE OAK CREEK
- K21 STONY CREEK / SOUTHWEST SWAMP
- K22 SAPPONY CREEK
- K23 NOTTOWAY RIVER / ROWANTY CREEK / JONES HOLE SWAMP
- K24 NOTTOWAY RIVER / HUNTING QUARTER SWAMP
- K25 RACCOON CREEK / SPRING CREEK
- K26 UPPER THREE CREEK / OTTERDAM SWAMP
- K27 LOWER THREE CREEK / ANGELICO CREEK / POPLAR SWAMP
- K28 NOTTOWAY RIVER / MILL SWAMP / NOTTOWAY SWAMP
- K29 ASSAMOOSICK SWAMP
- K30 LOWER NOTTOWAY RIVER / MILL CREEK

Cataloging Unit 03010202
- K31 BLACKWATER SWAMP / WARWICK SWAMP
- K32 UPPER BLACKWATER RIVER / CYPRESS SWAMP
- K33 MIDDLE BLACKWATER RIVER

Watershed-ID	Watershed Name

Cataloging Unit 03010202 (continued)
- K34 RATTLESNAKE SWAMP / MILL SWAMP
- K35 SEACOCK SWAMP
- K36 LOWER BLACKWATER RIVER/ KINGSALE SWAMP/ CORROWAUGH SWP

Cataloging Unit 03010203
- K37 UPPER CHOWAN RIVER / BUCKHORN CREEK
- K38 SOMERTON CREEK

Albemarle Sound Coastal Basin

Cataloging Unit 03010205
- K39 DISMAL SWAMP / CYPRESS SWAMP
- K40 NORTHWEST RIVER
- K41 NORTH LANDING RIVER
- K42 BACK BAY

Roanoke River Basin

Cataloging Unit 03010101
- L01 SOUTH FORK ROANOKE RIVER / BOTTOM CREEK / ELLIOTT CREEK
- L02 NORTH FORK ROANOKE RIVER / BRADSHAW CREEK
- L03 UPPER ROANOKE RIVER
- L04 ROANOKE RIVER / MASON CREEK
- L05 TINKER CREEK / CARVIN CREEK / GLADE CREEK
- L06 BACK CREEK
- L07 ROANOKE RIVER / SMITH MOUNTAIN LAKE / BEAVERDAM CREEK
- L08 UPPER BLACKWATER RIVER
- L09 MAGGODEE CREEK
- L10 LOWER BLACKWATER RIVER / SMITH MOUNTAIN LAKE
- L11 GILLS CREEK
- L12 LOWER SMITH MOUNTAIN LAKE
- L13 LEESVILLE LAKE / OLD WOMANS CREEK
- L14 UPPER PIGG RIVER
- L15 BIG CHESTNUT CREEK / LITTLE CHESTNUT CREEK
- L16 MIDDLE PIGG RIVER
- L17 SNOW CREEK / TURKEYCOCK CREEK

Watershed-ID	Watershed Name

Cataloging Unit 03010101
- L18 LOWER PIGG RIVER
- L19 ROANOKE RIVER / SYCAMORE CREEK
- L20 UPPER GOOSE CREEK
- L21 MIDDLE GOOSE CREEK / BOREAUGER CREEK / WOLF CREEK
- L22 LOWER GOOSE CREEK
- L23 UPPER BIG OTTER RIVER
- L24 NORTH OTTER CREEK
- L25 BIG OTTER RIVER / ELK CREEK
- L26 LITTLE OTTER RIVER / MACHINE CREEK
- L27 BIG OTTER RIVER / BUFFALO CREEK
- L28 LOWER BIG OTTER RIVER
- L29 FLAT CREEK

Cataloging Unit 03010102
- L30 ROANOKE RIVER / STRAIGHTSTONE CREEK / CHILDREY CREEK
- L31 SENECA RIVER
- L32 UPPER FALLING RIVER
- L33 SOUTH FORK FALLING RIVER
- L34 LOWER FALLING RIVER / LITTLE FALLING RIVER
- L35 MOLLEYS CREEK
- L36 ROANOKE RIVER / TURNIP CREEK / CATAWBA CREEK
- L37 CUB CREEK
- L38 ROANOKE RIVER / HUNTING CREEK / WALLACE BRANCH
- L39 ROANOKE CREEK / HORSEPEN CREEK / WARDS FORK CREEK
- L40 ROANOKE RIVER / SANDY CREEK
- L41 DIFFICULT CREEK
- L75 JOHN KERR RESERVOIR / BUTCHER CREEK
- L76 BUFFALO CREEK
- L77 BLUESTONE CREEK / LITTLE BLUESTONE CREEK

Cataloging Unit 03010103
- L42 UPPER DAN RIVER / LITTLE DAN RIVER
- L43 UPPER SOUTH MAYO RIVER / RUSSELL CREEK
- L44 SPOON CREEK

Watershed-ID	Watershed Name

Cataloging Unit 03010103 (continued)
- L45 LOWER SOUTH MAYO RIVER
- L46 NORTH MAYO RIVER
- L47 HORSE PASTURE CREEK
- L48 MAYO RIVER
- L49 MATRIMONY CREEK
- L50 UPPER SMITH RIVER
- L51 SMITH RIVER / PHILPOTT RESERVOIR / RENNET BAG CREEK
- L52 SMITH RIVER / TOWN CREEK / BLACKBERRY CREEK
- L53 SMITH RIVER / REED CREEK / BEAVER CREEK
- L54 LOWER SMITH RIVER
- L55 MARROWBONE CREEK
- L56 LEATHERWOOD CREEK
- L57 DAN RIVER / CASCADE CREEK
- L58 SANDY RIVER
- L59 SANDY CREEK(WEST)

Cataloging Unit 03010104
- L60 DAN RIVER / CANE CREEK
- L61 FALL CREEK
- L62 DAN RIVER / SANDY CREEK (EAST) / WINNS CREEK
- L63 BIRCH CREEK
- L64 DAN RIVER / LAWSONS CREEK / MIRY CREEK
- L73 DAN RIVER / AARONS CREEK
- L74 HYCO RIVER / BIG BLUEWING CREEK / MAYO CREEK

Cataloging Unit 03010105
- L65 UPPER BANISTER RIVER
- L66 CHERRYSTONE CREEK
- L67 MIDDLE BANISTER RIVER / ELKHORN CREEK
- L68 WHITEHORN CREEK
- L69 STINKING RIVER
- L70 SANDY CREEK
- L71 LOWER BANISTER RIVER / POLECAT CREEK
- L72 TERRIBLE CREEK

Watershed-ID	Watershed Name

L73-L74 (see 03010104)
L75-L77 (see 03010102)

Cataloging Unit 03010106
- L78 LAKE GASTON / ALLEN CREEK / COX CREEK
- L79 LAKE GASTON / MILES CREEK / FLAT CREEK / SMITH CREEK
- L80 LAKE GASTON / GREAT CREEK
- L81 LAKE GASTON / POPLAR CREEK
- L82 LAKE GASTON / PEAHILL CREEK

Yadkin River Basin

Cataloging Unit 03040101
- M01 FISHER RIVER / LITTLE FISHER RIVER
- M02 STEWARTS CREEK / PAULS CREEK / LOVILLS CREEK
- M03 UPPER ARARAT RIVER

New River Basin

Cataloging Unit 05050001
- N01 HELTON CREEK / BIG HORSE CREEK
- N02 UPPER NEW RIVER / WILSON CREEK
- N03 FOX CREEK
- N04 NEW RIVER / PEACH BOTTOM CREEK / LITTLE RIVER
- N05 ELK CREEK
- N06 NEW RIVER / CHESTNUT CREEK / BRUSH CREEK
- N07 CROOKED CREEK
- N08 NEW RIVER / SHORTS CREEK / PINE RUN
- N09 CRIPPLE CREEK
- N10 UPPER REED CREEK
- N11 LOWER REED CREEK
- N12 COVE CREEK
- N13 UPPER BIG REED ISLAND CREEK / LAUREL FORK
- N14 LOWER BIG REED ISLAND CREEK / GREASY CREEK / BURKS FORK
- N15 LITTLE REED ISLAND CREEK
- N16 NEW RIVER / CLAYTOR LAKE / MACKS CREEK

Cataloging Unit 05050001 (continued)
- N17 PEAK CREEK
- N18 NEW RIVER / CRAB CREEK
- N19 EAST FORK LITTLE RIVER
- N20 WEST FORK LITTLE RIVER
- N21 LITTLE RIVER / INDIAN CREEK / BRUSH CREEK
- N22 NEW RIVER / TOMS CREEK / BACK CREEK / STROUBLES CREEK

Cataloging Unit 05050002
- N23 NEW RIVER / SINKING CREEK
- N24 NEW RIVER / LITTLE STONY CREEK
- N25 WALKER CREEK
- N26 KIMBERLING CREEK
- N27 LITTLE WALKER CREEK
- N28 STONY CREEK
- N29 NEW RIVER / EAST RIVER
- N30 UPPER WOLF CREEK
- N31 HUNTING CAMP CREEK
- N32 LOWER WOLF CREEK / CLEAR FORK
- N33 LAUREL CREEK
- N34 RICH CREEK
- N35 NEW RIVER / ADAIR RUN
- N36 UPPER BLUESTONE RIVER
- N37 BLUESTONE RIVER / LAUREL FORK

Holston River Subbasin

Cataloging Unit 06010102
- O01 UPPER SOUTH FORK HOLSTON RIVER
- O02 SOUTH FORK HOLSTON RIVER / WHITETOP LAUREL CREEK
- O03 UPPER MIDDLE FORK HOLSTON RIVER
- O04 MIDDLE FORK HOLSTON RIVER / HUNGRY MOTHER CREEK
- O05 LOWER MIDDLE FORK HOLSTON RIVER
- O06 SOUTH HOLSTON LAKE / WOLF CREEK / FIFTEEN MILE CREEK
- O07 SOUTH FORK HOLSTON RIVER / BEAVER CREEK
- O08 REEDY CREEK

Watershed-ID	Watershed Name

Cataloging Unit 06010101
- O09 UPPER NORTH FORK HOLSTON RIVER
- O10 NORTH FORK HOLSTON RIVER / LAUREL CREEK
- O11 NORTH FORK HOLSTON RIVER / WOLF CREEK / TUMBLING CREEK
- O12 NORTH FORK HOLSTON RIVER / ABRAMS CREEK
- O13 LOWER NORTH FORK HOLSTON RIVER / POSSUM CREEK
- O14 BIG MOCCASIN CREEK

Clinch & Powell Rivers Subbasin

Cataloging Unit 06010205
- P01 UPPER CLINCH RIVER
- P02 CLINCH RIVER / INDIAN CREEK
- P03 CLINCH RIVER / MIDDLE CREEK
- P04 CLINCH RIVER / SWORDS CREEK / LEWIS CREEK
- P05 LITTLE RIVER
- P06 BIG CEDAR CREEK
- P07 CLINCH RIVER / THOMPSON CREEK
- P08 DUMPS CREEK
- P09 CLINCH RIVER / LITTLE STONY CREEK
- P10 LICK CREEK
- P11 GUEST RIVER
- P12 STONY CREEK
- P13 CLINCH RIVER / STOCK CREEK / COVE CREEK
- P14 COPPER CREEK
- P15 NORTH FORK CLINCH RIVER
- P16 CLINCH RIVER / BLACKWATER CREEK

Cataloging Unit 06010206
- P17 UPPER POWELL RIVER / CALLAHAN CREEK / ROARING FORK
- P18 SOUTH FORK POWELL RIVER
- P19 POWELL RIVER / CAMP CREEK
- P20 NORTH FORK POWELL RIVER
- P21 POWELL RIVER / HARDY CREEK
- P22 WALLEN CREEK
- P23 POWELL RIVER / MARTIN CREEK
- P24 POWELL RIVER / INDIAN CREEK

Watershed-ID	Watershed Name

Big Sandy River Basin

Cataloging Unit 05070201
- Q01 DRY FORK / JACOBS FORK / HORSEPEN CREEK
- Q02 TUG FORK
- Q03 KNOX CREEK

Cataloging Unit 05070202
- Q04 UPPER LEVISA FORK / GARDEN CREEK
- Q05 DISMAL CREEK
- Q06 LEVISA FORK / PRATER CREEK
- Q07 SLATE CREEK
- Q08 LEVISA FORK / HOME CREEK / BULL CREEK
- Q09 UPPER RUSSELL FORK
- Q10 RUSSELL FORK / LICK CREEK / FRYINGPAN CREEK
- Q11 MCCLURE RIVER / CANEY CREEK
- Q12 RUSSELL FORK / RUSSELL PRATER CREEK
- Q13 POUND RIVER
- Q14 CRANESNEST RIVER

Table 4.1-3 Nonpoint Source Pollution Assessment and Prioritization Rankings by Watershed

Header Code Definitions:

AG_N - Agriculture Nitrogen
AG_P - Agriculture Phosphorous
AG_S - Agriculture Sediment
URB_N - Urban Nitrogen
URB_N - Urban Phosphorous
URB_N - Urban Sediment
FOR_N - Forest Nitrogen
FOR_P - Forest Phosphorous
FOR_S - Forest Sediment
TOT_N - Total Nitrogen
TOT_P - Total Phosphorous
TOT_S - Total Sediment
RIMP - Riverine Impairments
EIMP - Estuarine Impairments
LIMP - Lacustrine Impairments

SWP - Source Water Protection
A - Very High
B - High
C - Moderate
D - Low
E - None

IBI - miniMIBI
A: 16-24/5
B: 16-24/1-3
C: 13-15
D: 1-12
E: Insufficient Data

Nutrient & Impairment Rank Codes
H - High
M - Medium
L - Low
N - Not Applicable

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
A01	M	M	M	M	L	L	L	L	L	M	L	L	L	N	L	E	D
A02	H	M	M	M	L	L	L	L	L	H	M	L	H	N	L	D	D
A03	H	H	H	M	L	L	L	L	L	H	M	M	L	N	L	B	C
A04	M	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	D
A05	H	L	L	M	M	L	L	L	L	M	L	L	L	N	L	E	A
A06	H	M	M	H	M	L	L	L	L	H	L	L	L	N	L	E	D
A07	H	M	L	M	L	L	L	L	L	M	L	L	M	N	L	E	D
A08	H	M	M	M	M	M	L	L	L	M	L	L	M	N	L	B	C
A09	H	M	M	H	H	H	M	M	M	H	M	M	L	N	L	A	D
A10	L	L	L	H	H	H	L	M	L	M	L	L	M	N	L	A	C
A11	L	L	L	H	H	H	L	L	L	M	L	L	L	N	L	E	D
A12	L	L	L	H	H	H	L	L	L	L	L	L	H	L	L	E	D
A13	L	L	L	H	H	H	L	L	L	L	L	L	M	M	L	E	D
A14	L	L	L	H	H	H	L	L	L	L	L	L	L	M	L	E	D
A15	L	L	L	H	H	H	L	H	L	L	M	L	M	M	L	E	D
A16	L	L	L	H	H	H	M	H	M	L	H	L	L	M	L	E	D
A17	H	H	M	H	H	M	L	L	L	H	H	L	M	N	L	C	C
A18	M	M	L	H	H	M	L	M	L	L	M	L	M	N	L	E	D
A19	M	M	L	H	H	H	L	L	L	L	M	L	M	N	L	B	C
A20	L	M	L	H	H	H	M	H	M	M	M	L	L	N	H	B	C
A21	L	M	L	H	H	H	L	M	L	M	M	L	L	N	L	E	C
A22	L	M	L	H	H	H	M	H	M	L	H	L	L	N	L	E	C

A23	L	M	L	H	H	H	L	H	L	L	H	L	M	N	H	E	D
A24	L	L	L	H	H	H	H	H	M	L	H	L	L	N	H	A	D
A25	L	L	L	H	H	H	H	H	M	L	H	L	M	M	L	E	C
A26	L	L	L	H	H	H	H	H	M	L	H	L	L	L	L	C	C
A27	L	L	L	H	H	H	H	M	H	L	L	M	L	N	L	B	C
A28	L	L	L	H	H	H	H	M	H	L	L	M	L	L	L	E	D
A29	L	L	L	H	M	M	L	L	L	L	L	L	L	M	M	B	C
A30	L	L	M	H	M	H	L	L	L	L	L	L	L	M	L	E	D
A31	M	M	M	M	M	M	L	L	L	M	L	M	H	M	L	E	D
A32	M	L	H	M	L	L	L	L	L	L	L	M	L	L	L	E	D
A33	M	L	H	M	L	M	L	L	L	L	L	M	L	L	L	E	D
A34	L	L	M	L	L	L	L	L	L	L	L	M	L	L	L	E	D
B01	L	L	L	L	L	L	H	H	H	M	M	H	L	N	L	E	C
B02	H	H	H	L	L	L	L	L	L	H	M	H	L	N	L	E	C
B03	L	M	M	L	L	L	M	L	M	L	L	M	L	N	L	E	N
B04	L	L	L	L	L	L	M	M	H	L	L	L	L	N	L	E	C
B05	L	L	L	M	L	M	L	L	L	L	L	L	L	N	L	E	D
B06	L	L	L	M	L	M	M	M	M	L	L	L	H	N	L	E	C
B07	L	L	L	M	L	M	L	L	L	L	L	L	L	N	L	E	D
B08	H	L	M	H	M	M	L	L	L	H	L	L	H	N	L	E	D
B09	H	L	M	H	M	H	L	L	L	H	L	L	M	N	L	E	D
B10	H	M	H	L	L	L	L	L	L	H	M	M	H	N	L	C	C
B11	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	B	D
B12	H	M	M	H	H	H	L	L	L	H	L	L	M	N	L	D	D
B13	H	H	H	L	L	L	L	L	L	H	M	M	H	N	L	D	D
B14	H	M	M	M	M	M	L	L	L	M	M	M	H	N	L	E	D
B15	H	M	M	M	M	M	L	L	L	H	M	L	H	N	L	E	D
B16	L	L	L	L	L	L	M	L	L	L	L	L	H	N	L	B	C
B17	M	M	M	L	L	L	L	L	L	M	L	L	H	N	L	B	C
B18	L	L	L	L	L	L	L	L	L	L	L	L	M	N	L	C	D
B19	H	M	H	M	M	M	L	L	L	M	M	M	H	N	L	B	D
B20	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	B	C
B21	H	H	H	M	M	M	L	L	L	H	M	M	H	N	L	B	C

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
B22	H	H	H	M	L	L	L	L	L	H	M	M	H	N	L	C	D
B23	H	H	H	M	M	M	L	L	L	H	M	M	M	N	L	C	D
B24	H	H	H	L	L	L	L	L	L	H	M	M	H	N	L	B	C
B25	H	H	H	H	H	H	L	L	L	H	H	H	H	N	L	D	D
B26	M	M	H	H	H	H	M	H	M	H	H	H	H	N	L	E	C
B27	H	H	H	M	M	M	L	L	L	H	H	H	H	N	L	E	N
B28	M	M	M	M	L	L	L	L	L	M	L	M	H	N	L	E	C
B29	H	H	H	H	M	H	L	L	L	H	H	H	H	N	L	E	C
B30	H	H	H	M	M	M	L	L	L	H	H	M	M	N	L	E	C
B31	L	L	L	M	M	M	L	L	L	L	L	L	M	N	L	C	D
B32	L	L	L	H	M	H	L	M	M	L	L	L	H	N	L	E	D
B33	L	L	L	L	L	L	M	H	H	L	M	L	L	N	L	E	C
B34	H	H	M	M	L	M	L	L	L	M	M	M	H	N	L	E	C
B35	H	M	L	M	M	H	L	L	L	H	L	L	M	N	L	E	B
B36	M	L	L	L	M	M	M	H	H	M	H	M	M	N	L	E	C
B37	M	M	M	M	M	M	L	L	L	M	L	L	L	N	L	E	C
B38	H	M	L	L	L	L	H	H	H	H	H	M	M	N	L	E	D
B39	H	M	L	M	M	M	L	L	L	H	M	L	H	N	L	E	C
B40	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	D	D
B41	L	L	L	H	H	H	M	L	M	L	L	L	L	N	L	C	C
B42	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
B43	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	B
B44	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	D	B
B45	H	M	M	M	M	M	L	L	L	H	M	L	H	N	L	D	D
B46	H	H	H	M	M	L	L	L	L	H	H	M	H	N	L	C	D
B47	M	M	M	M	L	M	L	L	L	M	L	L	H	N	L	E	D
B48	M	L	L	L	L	L	L	L	L	L	L	L	M	N	L	D	C
B49	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	D	C
B50	M	M	M	M	M	M	L	L	L	M	L	L	M	N	L	C	C
B51	L	L	L	M	M	H	M	M	M	L	L	L	L	N	L	B	A

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
B52	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
B53	M	L	L	M	M	M	L	L	L	M	L	L	L	N	L	B	D
B54	L	L	L	L	L	L	H	H	H	L	M	M	L	N	L	E	C
B55	L	L	L	M	M	M	L	L	L	L	L	L	L	N	L	E	D
B56	M	L	L	H	H	H	L	L	L	M	L	L	M	N	L	D	C
B57	H	L	M	L	L	L	L	L	L	M	L	L	L	N	L	C	C
B58	H	M	H	M	M	L	L	L	L	H	L	M	L	N	L	D	D
C01	M	M	H	M	M	M	M	L	M	M	M	H	L	L	L	E	D
C02	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	E	D
C03	L	L	L	M	M	M	L	L	L	L	L	L	L	L	L	E	B
C04	M	L	L	H	M	M	L	L	L	M	L	L	L	L	L	E	C
C05	L	L	L	H	M	M	L	L	L	L	L	L	M	L	L	C	D
C06	L	L	L	H	H	H	L	L	L	L	L	L	L	L	L	E	C
C07	L	L	L	H	H	H	L	L	L	L	L	L	L	M	L	B	C
C08	L	L	L	H	H	H	L	L	L	L	L	L	L	M	L	B	C
C09	H	H	H	L	L	L	L	L	L	H	M	H	M	L	L	E	D
C10	H	M	M	M	M	L	L	L	L	M	L	L	L	L	L	E	D
C11	M	L	M	M	M	M	L	L	L	M	L	M	L	M	L	E	D
C12	H	H	H	M	L	L	L	L	L	H	M	H	L	L	L	E	N
C13	H	H	H	M	L	L	L	L	L	H	M	M	L	L	L	E	D
C14	H	H	H	L	L	L	L	L	L	H	M	H	L	L	L	E	C
C15	H	H	H	M	M	M	L	L	L	H	H	H	L	L	L	E	C
C16	H	M	H	M	M	M	L	L	L	H	L	H	L	L	L	E	N
D01	M	L	M	H	H	H	L	L	L	M	L	M	L	L	L	E	D
D02	H	H	H	M	L	M	L	L	L	H	M	H	M	M	L	E	D
D03	H	M	M	M	L	L	L	L	L	H	L	L	L	L	L	E	D
D04	M	L	M	L	L	L	L	L	L	M	L	L	L	L	L	E	C
D05	H	M	H	L	L	L	L	L	L	M	L	H	L	L	L	E	C
D06	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	E	C

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
D07	L	M	M	H	H	H	M	M	M	L	M	M	L	H	L	E	N
E01	L	L	L	L	L	L	L	L	L	L	L	L	M	N	L	E	C
E02	M	L	L	M	M	M	L	L	L	L	L	L	L	N	L	E	C
E03	M	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	D
E04	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	D
E05	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	D
E06	M	M	M	L	L	L	L	L	L	M	L	L	M	N	L	E	C
E07	M	M	M	M	M	M	L	L	L	M	L	L	M	N	L	E	D
E08	H	H	M	M	M	M	L	L	L	H	M	M	M	N	L	E	C
E09	H	M	M	H	H	M	L	L	L	H	M	M	L	N	L	C	C
E10	M	M	M	M	L	L	M	M	M	M	M	M	L	N	L	E	D
E11	M	M	M	L	L	L	M	M	M	M	M	L	L	N	L	D	D
E12	H	H	M	M	M	M	M	M	M	H	H	M	L	N	L	C	C
E13	H	M	M	M	M	M	L	L	L	H	M	M	M	N	L	C	C
E14	M	M	M	L	M	M	M	M	L	M	M	L	L	N	L	D	D
E15	H	M	M	M	L	L	L	L	L	M	L	L	L	N	L	E	D
E16	H	M	M	L	L	L	M	L	L	H	M	M	L	N	L	E	D
E17	M	M	M	L	L	L	M	L	L	M	L	L	M	N	L	E	C
E18	L	L	L	M	M	M	H	H	H	M	M	M	L	N	L	C	A
E19	L	L	L	H	H	H	L	L	L	L	L	L	L	N	L	B	D
E20	L	L	L	H	H	H	M	L	M	L	L	L	L	M	L	E	A
E21	L	L	L	M	L	L	L	L	L	L	L	L	L	M	L	E	D
E22	L	L	M	L	L	L	M	L	M	L	L	M	L	L	L	E	D
E23	L	L	M	L	L	L	L	L	L	L	L	L	L	L	L	E	C
E24	L	L	M	L	L	L	L	L	L	L	L	M	L	H	L	E	B
E25	L	L	L	M	L	M	M	L	L	L	L	L	L	M	L	E	D
E26	M	M	H	M	M	M	M	M	M	M	M	M	L	L	L	E	C
F01	M	M	L	M	M	M	H	H	H	H	M	M	M	N	L	E	D
F02	L	L	L	M	M	M	H	H	H	M	M	M	L	N	L	D	D
F03	L	L	L	M	L	L	L	M	L	L	L	L	L	N	L	E	C

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
F04	M	M	M	M	M	M	L	L	L	M	L	L	H	N	L	B	C
F05	M	H	M	L	L	L	L	L	L	M	M	M	L	N	L	E	C
F06	L	L	L	M	M	M	H	M	M	M	L	L	M	N	L	E	D
F07	M	L	L	M	M	L	M	M	M	M	L	L	M	N	L	E	C
F08	L	L	L	H	H	H	H	H	H	M	H	H	L	N	L	E	C
F09	L	L	L	M	L	M	H	M	H	L	L	M	L	N	L	B	D
F10	M	M	L	L	L	L	L	L	L	L	L	L	L	N	L	E	D
F11	M	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	D
F12	M	L	M	M	M	M	L	L	L	M	L	L	M	N	L	E	A
F13	L	L	L	M	M	M	L	L	L	L	L	L	M	H	L	E	A
F14	L	L	L	L	L	M	M	L	M	L	L	L	L	L	L	E	B
F15	L	L	L	H	M	M	H	M	M	L	L	L	L	N	L	B	C
F16	L	L	L	M	M	M	M	M	M	L	L	L	L	N	L	E	C
F17	L	L	L	M	L	M	M	M	M	L	L	L	L	N	L	E	D
F18	L	L	L	M	L	L	M	M	M	L	L	L	L	N	L	E	C
F19	L	M	M	M	L	M	M	M	M	L	L	L	L	N	L	E	D
F20	L	L	L	M	M	M	M	M	M	L	L	L	L	N	L	C	D
F21	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	C
F22	L	L	L	L	L	L	M	M	L	L	L	L	L	N	L	E	D
F23	L	L	M	L	L	L	L	L	L	L	L	L	L	H	L	E	D
F24	L	L	L	L	L	L	L	L	L	L	L	L	L	M	L	E	C
F25	L	L	L	L	L	M	L	L	L	L	L	L	L	M	L	E	B
F26	L	L	L	M	L	M	L	L	L	L	L	L	L	M	L	C	D
F27	L	L	L	H	H	H	L	L	L	M	L	L	L	M	L	E	B
G01	L	L	L	H	H	H	L	L	L	L	L	L	L	L	M	E	C
G02	L	L	L	H	H	H	L	L	L	L	L	L	H	H	L	B	D
G03	M	M	M	M	M	M	L	L	L	M	M	M	L	M	L	B	A
G04	L	L	M	L	L	L	M	L	M	L	L	L	L	L	L	E	C
G05	L	L	L	H	H	H	L	L	L	L	L	L	H	N	L	E	D
G06	L	M	L	H	H	H	L	L	L	M	L	L	L	N	L	E	D

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
G07	L	M	L	L	L	L	L	L	L	L	L	L	L	N	L	B	C
G08	L	M	L	M	L	L	M	M	M	L	L	L	L	L	L	B	C
G09	L	M	M	L	L	M	H	H	H	M	H	H	M	N	L	B	C
G10	M	H	M	M	M	M	L	L	L	M	M	M	M	M	L	E	B
G11	M	H	M	H	H	H	L	L	L	M	M	L	L	M	L	B	C
G12	H	H	M	H	H	H	L	L	L	H	H	M	L	N	L	B	C
G13	H	H	H	H	H	H	M	M	L	H	H	M	L	M	L	E	B
G14	H	H	H	M	M	M	L	L	L	H	H	H	L	N	L	B	D
G15	L	L	L	H	H	H	L	L	L	L	L	L	L	H	L	C	C
H01	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	C	D
H02	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	B	A
H03	L	L	L	H	H	H	L	L	L	M	L	L	M	N	L	B	C
H04	L	L	M	M	M	M	L	L	L	L	L	L	L	N	L	B	D
H05	M	L	L	M	M	M	H	M	H	M	L	M	L	N	L	E	C
H06	H	M	H	M	M	M	H	H	H	H	H	H	M	N	L	E	D
H07	M	L	M	L	M	M	H	H	H	H	H	H	L	N	L	E	C
H08	L	L	L	L	L	L	H	H	H	H	H	H	L	N	L	E	C
H09	M	L	L	L	L	L	H	H	H	M	M	M	L	N	L	D	B
H10	M	L	L	L	M	L	M	M	M	L	L	L	M	N	L	E	D
H11	L	L	L	L	M	M	M	L	M	L	L	L	L	N	L	C	D
H12	L	L	L	H	H	H	H	H	H	M	M	H	M	N	L	E	D
H13	L	L	M	L	L	L	H	H	H	L	M	M	L	N	L	E	C
H14	L	L	L	L	L	L	H	H	H	M	M	H	L	N	L	E	C
H15	L	L	L	L	M	M	M	M	M	L	L	L	L	N	L	D	D
H16	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	D	D
H17	M	L	L	M	M	M	H	H	H	M	M	M	M	N	L	D	C
H18	L	L	L	M	M	H	L	M	M	L	L	L	L	N	L	E	D
H19	M	L	L	M	M	M	M	M	M	M	M	M	H	N	L	E	C
H20	L	L	L	M	M	M	H	H	H	M	M	M	L	N	L	E	D

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
H21	L	L	L	L	L	L	H	H	H	M	H	H	M	N	L	D	C
H22	L	L	L	L	L	L	H	H	H	M	H	H	L	N	L	E	C
H23	M	M	M	H	H	H	M	M	M	M	M	M	L	N	L	D	A
H24	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	D	A
H25	M	M	H	L	M	M	M	M	M	M	M	H	L	N	L	D	B
H26	L	M	M	H	H	H	M	M	M	M	M	M	M	N	L	D	A
H27	M	L	L	H	H	M	M	M	M	M	L	L	M	N	L	D	A
H28	L	L	L	H	H	H	L	M	M	L	L	L	H	N	L	D	C
H29	L	L	L	M	M	H	H	M	H	L	M	M	M	N	L	B	C
H30	M	L	L	M	H	M	L	L	L	M	L	L	L	N	L	D	C
H31	M	L	L	M	M	M	H	H	H	M	M	M	L	N	L	E	C
H32	M	M	M	M	M	M	H	H	H	H	H	H	L	N	L	E	C
H33	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
H34	L	L	L	L	M	L	H	H	H	L	M	M	M	N	L	E	D
H35	L	L	L	L	L	M	H	H	H	L	M	M	M	N	L	E	D
H36	L	L	L	L	L	L	M	M	M	L	L	L	M	N	L	E	D
H37	L	L	L	L	L	L	M	M	M	L	L	L	H	N	L	E	D
H38	L	L	L	H	M	M	L	L	L	L	L	L	L	N	L	C	A
H39	L	L	L	H	H	H	L	L	L	L	L	L	M	N	L	B	A
I01	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	C
I02	L	L	L	L	L	L	H	H	H	L	L	M	L	N	L	E	C
I03	L	L	L	L	L	L	H	H	H	L	L	M	L	N	L	E	C
I04	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	B	A
I05	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	C
I06	L	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	C
I07	L	L	L	L	L	L	H	M	M	L	L	L	L	N	L	D	D
I08	L	L	L	L	L	L	H	H	H	L	L	M	L	N	L	D	B
I09	L	L	L	L	M	M	M	L	M	L	L	L	M	N	L	C	C
I10	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	B
I11	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	A

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
I12	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	B
I13	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
I14	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	C
I15	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	D
I16	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
I17	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	A
I18	L	L	L	L	L	L	L	M	M	L	L	L	L	N	L	E	D
I19	L	L	L	L	L	L	L	M	L	L	L	L	L	N	L	E	C
I20	M	H	H	L	L	L	L	M	M	L	M	H	L	N	L	E	C
I21	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	A
I22	L	L	L	L	L	L	L	M	M	L	L	L	L	N	L	E	C
I23	L	L	L	L	L	L	H	M	M	L	L	L	L	N	L	E	C
I24	L	M	M	L	L	M	M	H	H	L	M	M	L	N	L	E	C
I25	L	L	L	L	M	L	L	L	L	L	L	L	L	N	L	B	D
I26	H	H	M	M	M	H	L	L	L	H	H	M	L	N	L	E	C
I27	L	L	L	L	M	M	M	M	M	L	L	L	L	N	L	E	D
I28	L	M	L	L	M	M	M	H	M	L	M	M	M	N	L	E	A
I29	L	L	L	L	L	L	M	L	L	L	L	L	L	N	L	E	C
I30	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	A
I31	L	L	L	L	L	L	H	H	H	L	M	M	L	N	L	E	C
I32	L	L	L	L	M	L	M	M	M	L	L	L	L	N	L	E	C
I33	M	M	M	L	L	L	L	M	L	L	M	M	L	N	L	C	C
I34	M	H	M	L	L	L	L	L	L	M	M	L	L	N	L	E	C
I35	H	H	H	M	H	H	L	M	M	H	H	H	L	N	L	C	C
I36	M	H	M	L	L	L	L	M	M	M	M	M	L	N	L	E	D
I37	M	M	M	M	M	M	M	H	M	L	M	M	L	N	L	E	A
I38	L	M	M	L	L	L	M	H	H	L	M	M	L	N	L	E	C
J01	M	L	L	L	M	M	H	H	H	M	M	H	L	N	L	C	A
J02	M	L	L	L	L	L	M	M	M	M	L	L	L	N	L	E	D

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
J03	M	M	M	L	L	L	M	M	M	M	M	M	M	N	L	E	C
J04	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	D
J05	L	L	L	L	M	L	L	L	L	L	L	L	M	N	L	E	C
J06	M	L	L	L	L	L	M	H	M	L	M	L	M	N	L	E	D
J07	L	L	L	L	L	L	M	M	M	L	L	L	M	N	L	E	D
J08	M	M	L	L	L	L	H	H	H	M	H	M	L	N	L	E	C
J09	M	M	M	L	M	L	M	M	M	M	M	M	L	N	L	E	D
J10	L	L	L	L	L	L	M	M	M	L	L	L	M	N	L	E	D
J11	M	L	L	L	L	L	M	H	M	L	M	L	L	N	L	E	B
J12	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	D
J13	L	L	L	L	L	L	M	H	H	L	M	L	L	N	L	E	D
J14	L	L	L	M	L	L	M	M	M	L	L	L	L	N	L	E	D
J15	L	L	L	H	H	H	L	L	L	L	L	L	L	H	L	B	A
J16	L	L	L	H	M	M	L	L	L	L	L	L	L	N	L	A	D
J17	L	L	L	H	M	M	L	L	L	L	L	L	L	H	L	D	B
K01	L	L	L	L	L	L	H	H	H	L	M	M	L	N	L	E	A
K02	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	A
K03	L	L	L	L	L	L	M	M	M	L	M	L	L	N	L	D	C
K04	L	L	L	L	M	M	H	H	H	L	M	M	L	N	L	E	C
K05	L	L	L	L	L	L	H	H	H	L	H	H	M	N	L	C	C
K06	M	M	L	L	M	M	M	M	M	L	M	M	M	N	L	C	C
K07	L	L	L	M	M	M	H	H	H	M	H	H	L	N	L	E	C
K08	L	L	L	L	L	L	H	H	H	L	M	M	M	N	L	C	D
K09	H	H	M	M	M	M	L	L	L	M	M	M	L	N	L	E	C
K10	L	M	L	L	L	L	H	H	H	M	H	H	M	N	L	E	D
K11	H	H	H	L	L	L	H	H	H	H	H	H	M	N	L	E	D
K12	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	E	D
K13	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	E	D
K14	L	L	L	L	L	L	M	H	H	L	L	L	L	N	L	D	C
K15	L	L	L	M	M	M	M	M	M	L	L	L	M	N	L	D	D

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
K16	L	L	L	L	M	M	M	M	M	L	L	L	L	N	L	C	A
K17	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
K18	L	M	M	L	L	L	M	M	M	L	M	M	L	N	L	E	C
K19	M	M	M	L	L	L	H	H	H	M	H	H	L	N	L	D	C
K20	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	A
K21	M	H	M	L	L	L	M	M	M	M	M	M	L	N	L	E	C
K22	M	H	H	L	L	L	H	H	H	H	H	H	L	N	L	E	C
K23	M	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	C
K24	M	M	L	L	L	L	L	L	L	M	M	L	L	N	L	E	A
K25	M	H	H	L	L	L	M	M	M	M	H	H	M	N	L	E	D
K26	M	H	H	L	L	M	H	M	M	M	H	H	L	N	L	E	D
K27	M	H	H	L	L	L	M	M	M	M	H	H	L	N	L	E	D
K28	H	H	H	L	L	L	M	M	M	H	H	H	L	N	L	B	A
K29	M	M	M	L	L	L	H	H	H	H	H	H	H	N	L	B	D
K30	H	H	H	L	L	L	M	M	M	H	H	H	L	N	L	E	A
K31	M	M	M	M	M	M	L	L	L	L	M	L	L	N	L	E	D
K32	H	H	H	L	L	L	M	M	M	H	H	H	H	N	L	E	C
K33	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	C	C
K34	H	H	H	L	L	L	L	L	L	H	H	H	M	N	L	E	D
K35	H	H	H	L	L	L	L	L	L	H	H	M	L	N	L	C	D
K36	H	H	H	M	M	M	L	L	L	H	H	M	L	N	L	B	C
K37	M	H	H	L	L	M	H	H	H	M	H	H	L	N	L	E	N
K38	H	H	H	M	M	M	L	L	L	H	H	H	L	N	L	E	C
K39	M	M	L	L	L	L	L	L	L	L	L	L	L	N	L	E	D
K40	H	H	M	M	L	L	L	L	L	H	H	M	L	L	L	B	D
K41	M	M	M	H	H	H	L	L	L	M	M	L	L	L	L	C	D
K42	L	M	M	H	H	H	L	L	L	L	L	L	L	M	L	E	D
L01	L	M	M	M	M	M	M	M	M	L	M	M	L	N	L	B	A
L02	L	L	L	M	M	M	L	M	M	L	L	L	M	N	L	B	A

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
L03	L	L	L	H	H	H	L	M	M	L	L	L	L	N	L	B	C
L04	L	L	L	H	H	H	L	M	L	L	L	L	H	N	M	E	C
L05	L	M	M	H	H	H	L	M	M	M	M	M	M	N	L	B	C
L06	L	L	L	H	H	H	L	M	L	L	L	L	L	N	M	E	D
L07	L	L	L	H	H	M	L	L	L	L	L	L	L	N	M	D	C
L08	M	M	M	L	L	L	L	L	L	M	M	M	H	N	L	C	D
L09	M	H	H	M	M	M	M	M	M	M	M	H	H	N	L	E	D
L10	H	H	H	M	L	M	L	L	L	H	M	M	M	N	H	E	C
L11	H	H	H	M	L	L	M	M	M	H	M	H	H	N	H	E	C
L12	M	M	H	M	M	H	M	M	M	M	M	H	L	N	L	E	B
L13	L	L	L	L	L	L	H	H	H	M	H	H	L	N	L	D	C
L14	M	M	M	M	M	M	M	M	M	M	M	M	M	N	L	E	A
L15	M	M	M	L	L	L	L	L	M	L	L	L	L	N	L	E	C
L16	H	H	M	L	L	L	M	M	M	H	H	H	H	N	L	E	A
L17	M	M	M	L	L	L	L	L	L	M	M	M	L	N	L	E	C
L18	M	M	M	L	L	L	M	M	H	M	M	H	M	N	H	E	B
L19	M	M	H	H	H	H	H	H	H	H	H	H	L	N	L	C	B
L20	L	L	L	M	M	H	L	L	M	L	L	L	L	N	L	E	D
L21	M	M	M	M	M	L	L	L	L	M	L	L	L	N	L	E	D
L22	M	L	M	M	M	M	H	M	H	M	M	M	L	N	L	D	B
L23	M	M	M	L	M	L	L	L	L	M	L	L	L	N	L	C	D
L24	M	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	B
L25	H	M	M	M	L	L	L	L	L	M	L	L	L	N	L	E	B
L26	H	H	H	H	H	H	L	L	L	H	M	M	H	N	L	E	D
L27	M	L	L	H	M	M	L	L	L	M	L	L	L	N	L	B	C
L28	H	M	H	H	H	H	H	M	H	H	M	H	M	N	L	B	C
L29	M	M	M	H	H	H	H	H	H	H	M	H	L	N	L	E	C
L30	M	M	M	L	M	L	M	M	M	M	M	M	L	N	L	E	A
L31	M	M	M	M	M	M	H	H	H	H	H	H	L	N	L	E	D
L32	M	M	H	M	M	M	H	H	H	H	H	H	L	N	L	E	C

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
L33	M	M	H	M	M	M	H	H	H	H	H	H	L	N	L	E	C
L34	H	M	H	L	M	M	H	M	H	H	H	H	L	N	L	D	A
L35	H	M	H	M	M	M	H	M	H	H	H	H	L	N	L	E	C
L36	M	M	M	L	L	L	M	M	M	M	M	M	L	N	L	E	D
L37	M	M	M	L	L	L	M	M	M	M	M	M	L	N	L	E	D
L38	M	M	M	L	L	L	H	H	H	M	H	H	L	N	L	E	B
L39	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	D	C
L40	M	H	H	L	L	L	M	M	M	M	H	H	M	N	L	E	A
L41	M	H	H	L	L	L	M	M	M	M	M	M	L	N	L	E	D
L42	H	M	H	L	L	L	L	L	L	M	L	M	L	N	L	E	A
L43	M	M	M	M	H	H	M	M	M	M	L	M	L	N	L	D	A
L44	M	L	M	H	H	H	H	H	H	M	M	H	L	N	L	E	B
L45	L	L	M	L	L	L	H	M	H	L	M	M	L	N	L	E	C
L46	L	L	L	M	M	M	M	M	H	L	M	M	L	N	L	E	B
L47	M	H	M	H	H	H	H	H	H	H	H	H	L	N	L	E	C
L48	L	M	M	M	H	H	H	H	H	H	H	H	L	N	L	E	N
L49	M	H	H	H	H	H	H	H	H	H	H	H	L	N	L	E	N
L50	M	M	H	L	L	L	M	L	M	L	L	M	L	N	L	E	A
L51	L	L	L	M	M	M	M	M	M	L	L	M	L	N	L	C	C
L52	M	M	M	H	H	H	M	M	M	M	M	M	M	N	L	C	A
L53	M	H	M	H	H	H	H	H	H	H	H	H	L	N	L	C	A
L54	L	M	L	H	H	H	M	H	M	M	M	M	M	N	L	E	A
L55	L	M	M	H	H	H	H	H	H	H	H	H	M	N	L	B	D
L56	M	H	M	M	M	H	M	M	M	M	H	M	L	N	L	C	D
L57	L	L	L	M	M	M	M	M	M	L	L	L	L	N	L	B	D
L58	M	M	M	M	M	M	M	M	M	M	M	M	L	N	L	E	D
L59	M	H	H	H	H	H	M	M	H	H	H	H	L	N	L	E	C
L60	M	H	H	H	H	H	M	M	M	H	H	H	L	N	L	E	C
L61	M	H	H	H	H	H	M	M	M	H	H	H	L	N	L	E	D
L62	M	H	H	L	L	L	M	M	M	M	M	M	L	N	L	E	D

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
L63	M	M	H	L	L	L	M	M	M	M	M	M	L	N	L	E	C
L64	M	M	M	M	M	M	M	M	M	M	M	M	L	N	L	B	D
L65	H	H	H	L	L	L	M	M	M	H	H	H	L	N	L	E	C
L66	M	M	M	M	M	M	M	M	H	M	H	H	M	N	L	C	D
L67	M	M	M	L	L	L	M	M	M	L	M	M	L	N	L	E	D
L68	H	H	H	L	L	L	L	M	M	H	M	M	M	N	L	D	C
L69	H	H	H	L	L	L	M	M	M	H	H	H	L	N	L	E	C
L70	M	M	M	L	L	L	M	M	M	M	M	M	M	N	L	E	D
L71	M	M	M	M	M	M	M	M	M	M	M	M	M	N	L	D	D
L72	M	H	H	L	L	L	M	M	M	M	M	H	L	N	L	E	N
L73	M	M	M	L	L	L	M	M	M	M	M	M	M	N	L	E	A
L74	M	M	M	L	L	L	M	M	M	L	M	M	M	N	L	E	D
L75	L	L	L	L	M	L	L	M	L	L	L	L	L	N	L	C	A
L76	H	H	H	L	L	L	H	H	H	H	H	H	L	N	L	D	D
L77	M	M	M	L	L	L	M	M	M	M	M	M	L	N	L	D	D
L78	L	M	L	L	L	L	H	H	H	L	M	M	L	N	L	E	A
L79	M	M	M	L	L	L	L	L	L	M	M	M	L	N	L	E	C
L80	H	H	H	L	L	L	L	L	L	M	H	M	L	N	L	E	D
L81	L	L	L	L	L	L	H	H	H	L	M	M	L	N	L	B	D
L82	L	L	L	L	L	L	H	H	H	L	H	M	L	N	L	B	D
M01	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	C
M02	L	L	L	M	M	M	L	L	L	L	L	L	L	N	L	E	D
M03	H	H	H	M	M	M	L	L	L	H	M	H	L	N	L	E	D
N01	L	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	C
N02	L	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	C
N03	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	C
N04	M	M	M	L	L	L	L	L	L	L	M	L	L	N	L	E	B
N05	L	M	L	L	L	L	L	L	L	L	L	L	M	N	L	E	C
N06	L	L	L	M	M	M	L	L	L	L	L	L	L	N	L	C	C
N07	M	M	L	M	M	L	L	L	L	L	L	L	L	N	L	D	C

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
N08	M	M	M	M	M	M	L	L	L	M	M	M	L	N	L	C	A
N09	M	M	M	L	L	L	L	L	L	L	M	M	L	N	L	D	D
N10	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	C	B
N11	M	M	M	M	M	M	L	L	L	M	M	M	L	N	L	D	C
N12	L	M	M	L	L	L	L	M	M	L	L	M	L	N	L	E	C
N13	H	H	H	L	L	L	L	L	L	H	M	M	L	N	L	E	C
N14	M	M	M	L	L	L	L	L	M	L	L	L	L	N	L	D	C
N15	M	M	M	M	M	M	L	L	L	M	L	L	L	N	L	C	B
N16	L	M	M	M	M	M	L	L	L	L	L	L	L	N	L	B	C
N17	L	L	L	M	M	M	L	L	L	L	L	L	L	N	L	B	B
N18	M	M	M	H	H	H	L	L	L	M	M	L	M	N	L	C	B
N19	H	H	M	L	L	L	L	M	M	M	M	M	L	N	L	E	B
N20	M	H	H	L	L	L	L	L	L	M	M	M	M	N	L	E	B
N21	M	H	M	L	L	L	L	L	L	M	M	M	M	N	L	C	C
N22	L	L	L	M	H	M	L	L	L	L	L	L	M	N	L	D	D
N23	M	M	M	L	L	L	L	L	L	L	L	L	L	N	L	E	B
N24	L	L	L	L	M	M	H	H	H	L	H	H	L	N	L	E	C
N25	L	M	L	L	L	L	L	M	M	L	M	L	L	N	L	E	C
N26	L	L	L	L	L	L	L	M	L	L	L	L	L	N	L	D	A
N27	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	C
N28	L	L	L	L	L	L	M	M	M	L	L	L	L	N	L	E	A
N29	L	L	L	M	M	M	L	L	L	L	L	L	L	N	L	E	A
N30	M	M	L	L	L	L	L	M	M	L	M	L	M	N	L	E	B
N31	L	L	L	L	L	L	M	H	M	L	L	L	M	N	L	E	C
N32	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	B
N33	L	L	L	L	L	L	M	H	H	L	M	M	L	N	L	E	C
N34	L	H	H	L	M	M	M	H	H	M	H	H	H	N	L	E	C
N35	L	M	M	L	L	M	H	H	H	L	H	H	L	N	L	E	C
N36	M	M	M	M	H	H	M	M	M	M	M	M	M	N	L	C	B

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
N37	L	L	M	M	M	M	H	H	H	M	M	H	M	N	L	C	C
O01	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	C	D
O02	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	C	A
O03	L	L	M	H	H	H	L	L	L	L	L	L	M	N	L	B	A
O04	L	M	L	M	M	M	L	L	L	L	L	L	M	N	L	E	A
O05	H	H	M	H	H	M	L	L	L	M	M	M	H	N	L	B	A
O06	M	H	M	H	H	H	L	L	L	M	M	M	L	N	L	B	D
O07	M	H	H	H	H	H	L	L	L	M	H	M	M	N	L	E	D
O08	M	H	H	L	L	L	L	L	L	L	H	H	L	N	L	E	C
O09	M	H	H	L	L	L	L	L	L	M	M	M	L	N	L	E	A
O10	L	L	L	L	L	L	L	L	L	L	L	L	M	N	L	E	A
O11	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	A
O12	L	L	L	L	L	L	L	L	L	L	L	L	L	N	L	E	A
O13	H	H	H	L	L	L	L	L	L	H	H	M	L	N	L	E	A
O14	H	H	H	L	L	L	L	L	L	M	H	M	L	N	L	D	A
P01	H	H	H	M	H	H	L	L	L	H	H	H	L	N	L	E	A
P02	M	M	M	M	M	M	H	M	H	M	M	H	L	N	L	C	A
P03	L	L	L	H	H	H	H	H	H	L	M	M	L	N	L	C	A
P04	M	H	H	M	L	M	H	H	H	H	H	H	L	N	L	E	A
P05	H	H	H	L	L	L	L	L	L	M	M	M	L	N	L	D	A
P06	M	M	M	L	M	L	L	L	L	M	M	M	L	N	L	C	C
P07	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	E	A
P08	L	L	L	M	H	H	H	H	H	L	M	M	L	N	L	E	C
P09	L	M	M	M	M	M	H	M	M	M	M	M	L	N	L	C	A
P10	L	M	M	M	M	M	H	H	H	M	H	H	H	N	L	C	C
P11	L	L	L	H	H	H	H	H	H	M	H	H	H	N	L	D	D
P12	L	L	L	L	L	L	M	M	L	L	L	L	L	N	L	E	C
P13	M	H	H	L	L	L	L	L	L	M	H	M	L	N	L	E	A
P14	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	D	A
P15	M	M	M	L	L	L	L	L	L	L	L	L	M	N	L	D	A

Watershed-ID	AG_N	AG_P	AG_S	URB_N	URB_P	URB_S	FOR_N	FOR_P	FOR_S	TOT_N	TOT_P	TOT_S	RIMP	EIMP	LIMP	SWP	IBI
P16	L	M	M	L	L	L	M	L	L	L	L	L	L	N	L	E	B
P17	L	L	L	M	H	H	H	H	H	M	H	M	L	N	L	D	A
P18	L	L	L	M	H	M	M	L	L	L	L	L	M	N	L	C	A
P19	M	M	M	M	M	M	L	L	L	L	L	L	L	N	L	C	A
P20	L	L	L	M	M	M	M	L	L	L	L	L	M	N	L	E	A
P21	H	H	H	L	M	L	L	L	L	H	M	M	L	N	L	E	A
P22	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	E	A
P23	H	H	H	L	L	L	L	L	L	H	H	H	M	N	L	E	A
P24	H	H	H	L	L	L	L	L	L	H	H	H	L	N	L	E	C
Q01	L	L	L	L	L	L	H	H	H	L	L	M	L	N	L	E	C
Q02	L	L	L	L	M	H	M	L	M	L	L	L	L	N	L	E	C
Q03	L	L	L	M	M	M	M	M	M	L	L	L	M	N	L	E	C
Q04	L	L	L	M	H	H	H	H	H	L	L	M	L	N	L	E	C
Q05	L	L	L	L	M	M	H	H	H	M	M	H	L	N	L	E	C
Q06	L	L	L	H	H	H	H	M	M	L	L	L	M	N	L	E	C
Q07	L	L	L	M	M	M	H	M	M	L	L	L	M	N	L	E	C
Q08	L	L	L	M	M	M	H	M	H	L	L	L	L	N	L	E	C
Q09	L	L	L	M	M	M	H	M	M	L	L	L	L	N	L	E	B
Q10	L	L	L	L	M	M	H	H	H	L	L	L	L	N	L	E	D
Q11	L	L	L	M	M	L	H	H	H	L	L	L	L	N	L	E	C
Q12	L	L	L	M	M	M	H	H	H	L	M	M	L	N	L	E	D
Q13	L	L	L	M	H	H	H	H	H	L	M	L	L	N	L	D	D
Q14	L	L	L	H	H	H	H	H	H	M	H	H	L	N	L	D	D
R01	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	B

Table 4.1-4 List of Virginia NPS TMDL Projects through 2004

Hydrologic Unit	Name	County	Impairment Cause	Study Underway	Study Completed	Imp Plan
Potomac River Basin						
A02	Catoctin Creek	Loudoun Co.	FC		X	X
A02	North Fork Catoctin Creek	Loudoun Co.	FC		X	X
A02	South Fork Catoctin Creek	Loudoun Co.	FC		X	X
A03	Limestone Branch	Loudoun Co.	FC		X	
A05	Cromwells Run	Loudoun/Faquier Co.	FC		X	
A06	North Fork Goose Creek	Loudoun Co.	FC		X	
A07	Beaverdam Creek	Loudoun Co.	FC		X	
A08	Little River	Loudoun Co.	FC		X	
A08	Little River	Loudoun Co.	BC	X		
A08	Goose Creek	Loudoun Co.	BC	X		
A08	Sycolin Creek	Loudoun Co.	FC		X	
A12	Four Mile Run	Arlington Co.	FC		X	
A15	Accotink Creek	Fairfax Co.	FC		X	
A17	Licking Run	Faquier Co.	FC	X		
A17	Cedar Run	Faquier Co.	FC	X		
B09	Opequon Creek	Frederick Co.	FC	X		
B09	Lower Opequon Creek	Frederick Co.	BC	X		
B09	Abrams Creek	Frederick Co.	FC	X		
B09	Abrams Creek	Frederick Co.	BC	X		
B10	Middle River	Augusta Co.	FC	X		
B12	Lewis Creek	Augusta Co., City of Staunton	FC	X		
B12	Lewis Creek	Augusta Co., City of Staunton	BC	X		
B13	Moffett Creek	Augusta Co.	FC	X		
B13	Moffett Creek	Augusta Co.	BC	X		
B14	Christians Creek	Augusta Co.	FC		X	
B14	Christians Creek	Augusta Co.	BC	X		
B15	Polecat Draft	Augusta Co.	FC	X		
B15	Middle River	Augusta Co.	FC	X		
B19	Mossy Creek	Rockingham Co.	FC	X		
B21	Lower Dry River	Rockingham Co.	FC		X	X
B21	Lower Dry River	Rockingham Co.	Nitrate		X	X
B22	Muddy Creek	Rockingham Co.	FC		X	X
B22	Muddy Creek	Rockingham Co.	Nitrate		X	X
B22	Muddy Creek	Rockingham Co.	BC		X	
B24	Long Glade Creek	Rockingham Co.	FC	X		
B25	Cooks Creek	Rockingham Co.	FC		X	
B25	Cooks Creek	Rockingham Co.	BC	X		
B26	Blacks Run	Rockingham Co.	FC		X	
B26	Blacks Run	Rockingham Co.	BC		X	

Table 4.1-4 List of Virginia NPS TMDL Projects through 2004

B27	Pleasant Run	Rockingham Co.	BC		X	
B27	Pleasant Run	Rockingham Co.	FC		X	X
B28	Naked Creek	Augusta Co.	FC		X	
B29	Mill Creek	Rockingham Co.	FC		X	X
B29	Mill Creek	Rockingham Co.	BC		X	
B30	South River	Augusta Co.	FC	X		
B34	Cub Run	Rockingham Co.	FC	X		
B39	Hawksbill Creek	Page Co.	FC	X		
B45	Holmans Creek	Rockingham/Shenandoah Cos.	FC		X	X
B45	Holmans Creek	Rockingham/Shenandoah Cos.	BC		X	X
B46	Linville Creek	Rockingham Co.	BC	X		
B46	Linville Creek	Rockingham Co.	FC		X	
B47	Fridley Run	Rockingham Co.	BC	X		
B47	Mountain Run	Rockingham Co.	BC	X		
B47	Smith Creek	Rockingham/Shenandoah	FC	X		
B50	Toms Brook	Shenandoah Co.	BC	X		
Rappahannock River Basin						
E01	Thumb Run	Fauquier Co.	FC		X	
E02	Carter Run	Fauquier Co.	FC	X		
E02	Great Run	Fauquier Co.	FC	X		
E07	Muddy Run	Culpeper Co.	FC	X		
E07	Upper Muddy Run	Culpeper Co.	FC	X		
E09	Mountain Run	Culpeper Co.	FC		X	
E10	Deep Run	Stafford, Fauquier	FC	X		
York River Basin						
F12	Mechumps Creek	Hanover Co.	pH	X		
F12	Mechumps Creek	Hanover Co.	FC	X		
F13	Matadequin Creek	Hanover Co.	pH	X		
F13	Matadequin Creek	Hanover Co.	FC	X		
James River Basin						
G02	Fourmile Creek	Henrico Co.	FC	X		
G02	Fourmile Creek	Henrico Co.	pH	X		
G05	Chickahominy River	Hanover Co.	BC	X		
G06	White Oak Swamp	Henrico Co.	FC	X		
G06	White Oak Swamp	Henrico Co.	pH	X		
H01	Reed Creek	Bedford Co.	FC	X		
H28	Moore's Creek	Albermarle Co.	FC		X	X
H36	Willis River	Cumberland Co.	FC		X	
H39	Tuckahoe Creek	Henrico Co.	FC	X		
H39	Tuckahoe Creek	Henrico Co.	DO	X		
I26	Looney Mill Creek	Botetourt Co.	FC	X		
I33	Kerrs Creek	Rockbridge Co.	BC		X	

Table 4.1-4 List of Virginia NPS TMDL Projects through 2004

J01	Appomattox River		FC	X		
J02	Spring Creek	Prince Edward Co.	FC	X		
J03	Little Sandy Creek	Prince Edward Co.	FC	X		
J03	Bush River	Prince Edward Co.	FC	X		
J04	Bush River	Prince Edward Co.	FC	X		
J05	Briery Creek	Prince Edward Co.	FC	X		
J06	Horsepen Creek	Cumberland Co.	FC	X		
J06	Angola Creek	Cumberland Co.	FC	X		
J06	Saylors Creek	Prince Edward/Amelia	FC	X		
J08	Flat Creek	Amelia Co.	FC	X		
J11	Deep Creek	Nottoway Co.	FC	X		
J11	West Creek	Nottoway/Amelia	FC	X		
J15	Appomattox River	Prince George/Chesterfield	FC	X		
J16	Swift Creek	Chesterfield Co.	FC	X		
J17	Swift Creek	Chesterfield Co.	FC	X		
		Chowan River Basin				
K16	Hurricane Branch	Nottoway Co.	BC	X		
		Roanoke River Basin				
L02	Wilson Creek	Montgomery Co.	FC	X		
L05	Carvin Creek	Roanoke Co.	FC	X		
L05	Glade Creek	Roanoke Co.	FC	X		
L05	Laymantown Creek	Botetourt Co.	FC	X		
L05	Lick Run	Roanoke Co.	FC	X		
L05	Tinker Creek	Roanoke Co.	FC	X		
L08	Middle Blackwater River	Franklin Co.	FC		X	X
L08	Middle Blackwater River	Franklin Co.	BC		X	
L08	Upper Blackwater River	Franklin Co.	FC		X	X
L08	Upper Blackwater River	Franklin Co.	BC		X	
L08	North Fork Blackwater River	Franklin Co.	FC		X	X
L08	North Fork Blackwater River	Franklin Co.	BC		X	
L08	South Fork Blackwater River	Franklin Co.	FC		X	X
L09	Maggodee Creek	Franklin Co.	FC		X	
L10	Lower Blackwater River	Franklin Co.	FC		X	
L11	Gills Creek	Franklin Co.	FC		X	
L23	Sheeps Creek	Bedford Co.	FC		X	
L25	Elk Creek	Bedford Co.	FC		X	
L26	Machine Creek	Bedford Co.	FC		X	
L26	Little Otter River	Bedford Co.	FC		X	
L28	Big Otter River	Campbell Co.	FC		X	
L34	Falling River	Campbell Co.	FC	X		
L41	Difficult Creek	Halifax Co.	FC	X		
L43	South Mayo River	Patrick Co.	FC	X		

Table 4.1-4 List of Virginia NPS TMDL Projects through 2004

L63	Birch Creek	Pittsylvania, Halifax	FC	X		
New River Basin						
N17	Peak Creek	Pulaski Co.	BC	X		
N17	Peak Creek	Pulaski Co.	FC	X		
N18	Crab Creek	Montgomery Co.	FC	X		
N18	Crab Creek	Montgomery Co.	BC	X		
N20	Dodd Creek	Floyd Co.			X	
N21	Mill Creek	Montgomery Co.			X	
N22	Stroubles Creek	Montgomery Co.	BC	X		
N22	Back Creek	Pulaski Co.	FC	X		
N31	Hunting Camp Creek	Bland Co.	BC	X		
N31	Hunting Camp Creek	Bland Co.	FC	X		
N36	Bluestone River	Tazewell Co.	FC	X		
N36	Bluestone River	Tazewell Co.	BC	X		
Upper Tennessee River Basin						
O05	Byers Creek	Washington Co.	FC		X	X
O05	Byers Creek	Washington Co.	BC		X	
O05	Cedar Creek	Washington Co.	FC		X	X
O05	Cedar Creek	Washington Co.	BC		X	
O05	Hall Creek	Washington Co.	FC		X	X
O05	Hall Creek	Washington Co.	BC		X	
O05	Hutton Creek	Washington Co.	FC		X	X
O05	Hutton Creek	Washington Co.	BC		X	
O07	Little Creek	Washington Co.	FC		X	
O07	Beaver Creek	Washington, City of Bristol	FC	X		
O07	Beaver Creek	Washington, City of Bristol	BC	X		
O09	North Fork Holston River	Smyth Co.	BC	X		
P01	Clinch River	Tazewell Co.	BC	X		
P04	Lewis Creek	Russell Co.	BC	X		
P11	Guest River	Wise Co.	BC	X		
P11	Guest River-Crab, Orch, etc.	Wise Co.	FC	X		

Impairment key

FC = Fecal Coliform
BC = Benthic Community
DO = Dissolved Oxygen
pH = pH
Nitrate = Nitrate Nitrogen